

TWELFTH ANNUAL REPORT

OF THE

PENNSYLVANIA

DEPARTMENT OF AGRICULTURE.



1906.

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PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

OFFICIAL LIST.

1906.

N. B. CRITCHFIELD, *Secretary*,
Stoyestown, Somerset County.

A. L. MARTIN, *Dep'y Sec'y and Director of Farmers' Institutes*,
Enon Valley, Lawrence County.

M. D. LICHLITER, *Chief Clerk*,
Allegheny.

E. C. FIRST, *Stenographer*,
Harrisburg.

GEORGE F. BARNES, *Messenger*,
Rossville, York County.

B. H. WARREN, *Dairy and Food Commissioner*,
West Chester, Chester County.

O. D. SCHOCK, *Assistant to Dairy and Food Commissioner*,
Hamburg, Berks County.

MAY V. RHONE, *Clerk, Dairy and Food Commissioner*,
Centre Hall, Centre County.

WILLIAM R. SWARTZ, *Messenger, Dairy and Food Commissioner*,
Duncannon, Perry County.

H. A. SURFACE, *Economic Zoologist*,
State College, Centre County.

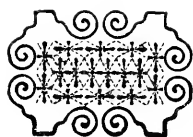
NORMAN G. MILLER, *Assistant Economic Zoologist*,
Marion, Franklin County.

A. F. SATTERTHWAIT, *Clerk, Economic Zoologist*,
Kennett Square, Chester County.

KATHRYN P. FIRST, *Stenographer, Economic Zoologist*,
Harrisburg.

L. R. WHITE, *Messenger, Economic Zoologist*,
Jermyn, Lackawanna County.

LEONARD PEARSON, *State Veterinarian*,
Philadelphia.



TWELFTH ANNUAL REPORT
OF THE
Secretary of Agriculture.

Department of Agriculture,

Harrisburg, Pa., Jan. 1, 1907.

To His Excellency, Samuel W. Pennypacker, *Governor of Pennsylvania* :

Sir: In compliance with the requirements of the Act of Assembly, creating a Department of Agriculture of Pennsylvania, I have the honor to submit my report of said Department for the year 1906.

The past year has marked much advance in the agriculture of Pennsylvania. The swing toward the West of the pendulum of agricultural progress is slackening and a new era appears to be setting in for the farms and farmers of the Eastern states.

There was a time when this was the leading farming state of the Union, a time when civilization was but feeling its way beyond the Allegheny Mountains. As Ohio and, later, the other states of the Ohio, Mississippi and Missouri valleys developed, the center of the agricultural industry moved steadily westward. The virgin, fertile lands of the West were given free to settlers, who divided the prairies into productive farms, the products of which were taken to the eastern markets upon the railroads that rapidly gridironed the new country and made possible the most marvellous development the world has ever seen. The agriculture of the West developed more rapidly than the population of the country, so that an enormous surplus of grain, food stuffs and provisions was available for export. The Western farmer farmed, at first, without regard to the future of the soil. He mined and marketed the great stores of surplus fertility that had been accumulating for centuries. His land produced cheap and bountiful harvests. The settlers of the West were drawn largely from the older states of the East and for a generation many of the most capable and ambitious as well as the restless sons of Eastern farmers migrated to the West and took part in its development.

Under such conditions of competition, the agriculture of the East, for a third of a century, languished. Prices were at such a level as to render it difficult to conduct a farm profitably unless it was de-

voted to the production of crops that did not have to meet direct competition with staple products of the West. The farmers of the Eastern states have found themselves in much the condition and confronted by problems similar to those that have influenced the course of agriculture in those countries of Europe that are not shielded by a protective tariff. The wheat-growing and the meat-producing farms of Great Britain and the grain fields of northern and south-eastern Europe have been affected by the same causes and in the same way as the general farms of Pennsylvania, New York and Maryland.

Gradually, however, the good lands of the West have been occupied and their surplus stores of fertility are so far used up that it is now necessary to farm less extensively, with more skill and at higher cost. Moreover, great cities have grown up in the Valley of the Mississippi and these are rapidly increasing in number and population. There is, therefore, at the present time a home market in the Central West and the West, that requires large and continually larger supplies of food, thus reducing the surplus for shipment to distant places.

During these years of transition, the farmers of the East, with much stress and trial, have been adjusting themselves and their properties to the new and, apparently inexorable conditions. They have sought and practised new methods and have become proficient therein; methods that are in accord with the modern science of agriculture. They made their minds receptive to the teachings of the successful experience of others and to the guidance of those who are devoting themselves to the elucidation of the problems of the farm. They have either learned to meet the new adverse conditions—or they have lost in their contest with changing, modern economic forces. And now, that this battle has been fought, the conditions are readjusting in such a way as to lessen the competition of the West and, by reason of the growth of the population, to increase the local home market. These influences have led to better conditions that are reflected in the greater prosperity of farmers and in higher prices for farm products and farm lands.

The outlook for Eastern agriculture was never brighter; but the advantages that are opening are not for those who fail to recognise that conditions have changed and that methods and practices, to be successful, must fit the time. We do not for an instant recommend the relinquishment of the old and well tried methods of those who went before us. On the contrary, our chief reliance must always be in the old well understood and tested methods. But no method should be adhered to merely because it is old, or because it has the sanction of the approval of a community; no method should be regarded as good enough so long as there is a possibility of improving it and new methods should not be frowned upon because they are new, but they should be viewed impartially, with a mind open to conviction, and with the determination to take advantage of the good that they contain. In this way, by holding fast to the traditions of the past and that which is tried and true and at the same time by seeking and testing new methods and improvements, the most conservative, the safest and the best advance is made. As the new is found to be secure it may be relied upon.

EDUCATIONAL AGENCIES.

In this development, Pennsylvania has been among the foremost of the states of the Union and her schools and colleges, especially the institutions furnishing technical instruction in agriculture and the allied subjects, have done much good. The good of these institutions has been disseminated and added to by the farmers' institutes and the Bulletins of this Department. It is one thing to produce new knowledge; it is quite another thing to bring it before the practical farmer so that he will realize its importance and be in position to take advantage of it. The persistent, systematic work of the lecturers upon the farmers' institute staff is of the greatest value to the State in this connection.

Reference has been made in previous reports to the work of the Pennsylvania State College. This institution was established by the State Agricultural Society in 1854 as the Farmers' High School. It was opened in 1859, and was intended to be a place where farmers' sons, and others interested in, or intending to engage in agriculture, might obtain suitable scientific and practical instruction. The founders were interested in establishing an institution where a new kind of instruction would be furnished such as was not then supplied in any existing institution. It is unnecessary to trace the changes of name, policy and work of the college, but it may be said that it appears to be unfortunate that it did not more closely follow the example of that other pioneer school of agriculture established about the same time at Lansing, Michigan; for, in its endeavor to cover much ground, some of which was already well covered by existing institutions, the tax upon the resources of the college was such as to hamper the development of the agricultural department. The trustees of the college have now, happily, taken the position that their foundation was not laid for the erection of a University or for the development of an institution to duplicate unnecessarily work already well done in the twenty-seven colleges and universities of Pennsylvania. They now recognize that in the field of agriculture, there is much need for the work of the college and this is beginning to receive more adequate support from the trustees and from the legislature than ever before.

The agricultural people of Pennsylvania are responsible for what may be termed the revival of interest in agriculture at State College. The trustees of the college are to be congratulated upon their approval of the well considered proposals for the development of the work that the college was founded to carry on, and it is to be hoped that this work will have the general and active support of the farmers of the State.

A farm school has been established near Doylestown, in Bucks County, through contributions made by individuals. This school has been in operation several years and has steadily grown in its equipment and resources. It is appropriate that it should be mentioned in a public document, first, because it promises to be of service in attracting young men of the Jewish race from the crowded cities to the country, and in preparing them for agricultural careers. This work is an expression of a desire among sociologists to foster some of the undeveloped resources of the country and, at the same time, to lessen some of the overcrowding of congested districts of cities.

The policy of this school is determined to a large extent, and is wisely directed, by Rabbi Krauskopf. A second reason for calling attention to this institution is that it is fostered by the State through a biennial appropriation of \$15,000. It is believed that there is a considerable field of usefulness for work of the character that this school is doing, and it is deserving of the commendation of this Department.

A few of the rural high schools in Pennsylvania, and particularly that at Waterford, in Erie County, have developed courses of instruction in agriculture. This movement is a very important one, and its development is a thing greatly to be desired. The rural high school reaches rural sentiment in a way that is impossible for a distant college. Of course the agricultural instruction furnished in a high school must be rather elementary, but if it is well thought out and systematized it may be made to be of much value. By means of it, the reason for things is emphasized and the pupils are placed in position to draw sound conclusions from ascertained facts. Professor L. H. Bailey, in an address on "The Schools of the Future," expresses himself as follows: "In an agricultural community, for example, all the farms of the neighborhood will afford training in the elements of failure and success. There is no reason why the pupils should not know why and how a man succeeds with his orchard or dairy or factory, as well as to have the cyclopedic information about the names of capes and mountains, dates, and the like; and why should not every good farmer explain his operations to the pupils? Such work, if well done, would vitalize the school and lift it clean out of the ruts of tradition and custom. It would make a wholly new enterprise of the school, rendering it as broad and significant and native as the community itself; not a puny exotic effort for some reason dropped down in the neighborhood. When the public schools begin to touch experience and pursuits in a perfectly frank and natural way, we hope that persons who have money to give for education will bestow some of it on elementary and country schools, where it will reach the very springs of life." This idea is gradually being accepted and it means much for the improvement of country life.

The Veterinary Department of the University of Pennsylvania must also be mentioned as one of the important institutions of the State for furnishing instruction in some of the subjects allied to agriculture. This Department was established in 1884, and has been conducted by the University since that time. It has always been hampered by lack of funds, and its work has been made possible through the generosity of a few philanthropic citizens of Philadelphia and by the self-sacrificing devotion of members of its teaching staff. It has graduated nearly 400 veterinarians, many of whom are sons of Pennsylvania farmers, and many are located in the rural districts of Pennsylvania. The importance of preventing infectious diseases of animals and of developing animal hygiene is generally recognized. The ruinous losses that have affected many communities and countries and that have come from neglect of the teachings of veterinary science are such as to make clear the great need for the kind of work that this school is doing. The State has assisted the University of Pennsylvania in providing a building to house this school, but thus far, no appropriation has been made

for the maintenance of its work. Other states, notably, our neighbors, New York and Ohio, have found it profitable to take part in the support of the veterinary departments of their state universities. The need for the work of such a school is so great as to fully justify a recommendation to the legislature that it give careful heed to a request for public support for this work at the University of Pennsylvania, as recommended by several of the leading agricultural and livestock organizations.

In this connection, mention may be made of a report of a commission, appointed by your Excellency, to consider regulations to govern meat inspectors in disposing of the carcasses of animals afflicted with tuberculosis. The Commission appointed to consider this problem is composed of leading sanitarians of Pennsylvania, assisted by one from outside of the State, Dr. D. E. Salmon, lately chief of the Bureau of Animal Industry of the United States Department of Agriculture. Considering the investigation to be made by this Commission of very great importance to the livestock industry of the State as well as to the health of the people of the Commonwealth, and believing that in order to get Dr. Salmon, who is not a citizen of Pennsylvania, to devote to it the time necessary to make his part of the investigation and report as thorough as these combined interests require, a contract was made with Dr. Salmon, after consultation with the State Veterinarian, in which it was stipulated that his investigation should be made as complete as the facilities at his command would warrant, and that he should submit to this Department a report upon the relation of bovine tuberculosis to public health that should be approved by the State Veterinarian. This contract was made under the provisions of Section 6 of the Act of March 13, 1895, and Dr. Salmon's report will be published in a bulletin of this Department which will also contain the reports of the other gentlemen associated with him upon the Commission referred to, whose services were cheerfully given to this important work on account of their patriotic devotion to their own State. I regard this report as being of so much importance that I wish especially to invite to it the attention of all persons interested in this much discussed and far reaching problem.

MEAT INSPECTION.

The Federal Government has recently enacted and placed in operation a new meat inspection law, under which the federal meat inspection service is greatly extended. It now covers practically all meats that are prepared in one state and shipped to another. The slaughter houses and other meat preparing establishments engaged in business exclusively in one state do not come under federal inspection. It has been found that the effect of the guarantee that accompanies federally inspected products is of considerable advantage to dealers, and it is steadily receiving more consideration and respect from the public. If this tendency becomes much stronger, the products of local houses that are without inspection will be found to be at a decided disadvantage in the public markets. The effect of this will be to hamper the development of local slaughter houses and to advance the interests of those establishments that are under approved inspection. This will have a

tendency to diminish local slaughtering and thereby lessen the market for beef prepared in our own State. For this reason, and also more particularly on account of the hygienic and sanitary importance of meat inspection, it is to be hoped that the coming legislature of 1907 will give careful consideration to a proposal to establish a State meat inspection service.

THE MAGNITUDE OF OUR AGRICULTURE.

Pennsylvania is commonly regarded as an essentially industrial state. When the industries of the State are passed in mental review, one thinks of the great manufacturing enterprises, the steel mills, the mines of bituminous and anthracite coal, the oil and gas wells and the great natural deposits of iron ore, limestone, cement, rock and slate. In the minds of many people, agriculture is an after consideration. The industries mentioned are so large, and many of them are so much greater than similar industries in other states that the actual and intrinsic importance of our agriculture is not generally realized.

If Pennsylvania had no more than the usual quota of mineral deposits and of manufacturing plants, she would still occupy a distinguished position among her sister commonwealths on account of the extent and value of her agriculture. Pennsylvania is second in the production of hay. The crop for the year 1906 amounted to 3,993,627 tons and was worth \$53,514,602. Pennsylvania is also second in the production of buckwheat; the crop for 1906 amounted to 4,788,000 bushels, and it is second in the production of potatoes, producing during the past year 23,856,918 bushels. The value of the winter wheat crop was \$22,095,623 and was surpassed by but five states. In rye, Pennsylvania led all other states with a crop of 6,025,011 bushels. The value of the oat crop was \$12,090,268 and the corn crop \$30,139,324. The value of the farm products of Pennsylvania is just about equal to the value of farm products of some of the great agricultural states of the West. The most productive and the best farmed agricultural county in the United States is the County of Lancaster, in Pennsylvania, which sells from its farms products valued at about \$10,000,000 a year.

In livestock husbandry, Pennsylvania holds a very important position. More market milk is produced in this State than in any other, and there are, upon the farms of Pennsylvania, 1,097,590 milch cows, the estimated value of which is \$37,640,337. There are in Pennsylvania about 750,000 horses and mules, worth about \$75,000,000. The horses of Pennsylvania are 40 per cent. more numerous and worth 100 per cent. more money than the horses of Kentucky, a leading horse state. Pennsylvania has more than a million sheep; more, in fact, than the states of Illinois or Wisconsin and more than Missouri and Kansas combined.

The sheep industry of Pennsylvania would be more highly developed and more productive than it is if it were not for the pest of dogs. Some legislation should be enacted to eliminate the worthless and ownerless dogs that are of no value whatever and that inflict extreme injury upon this important industry.

There are about 1,000,000 swine in Pennsylvania, valued at \$8,447,313. The swine industry is capable of profitable extension. By

regard for the ascertained facts of hygiene, it is possible to avoid most of the danger from hog cholera. With this foe under control, the keeper of swine, with judicious management, has little to fear from other diseases. The market for hogs is so good that Pennsylvania farmers should arrange to derive more benefit from it.

WORK DONE BY THE DEPARTMENT.

I shall not take up space in this report to dwell at length upon the work done by the respective Divisions of the Department, each of which has an official head whose report will be given to the public either with the Annual Department Report or in bulletin form. Owing to the existence of an Act of Assembly prohibiting more than one publication of a public document, the custom that prevailed in the past of publishing these Division reports as bulletins and also as a part of the Annual Department Report, has been discontinued. Where, as is the case with the Dairy and Food Bureau, many persons who are not directly interested in Agriculture and who have but little interest in the Department Report are anxious to get the Commissioner's report, it may be thought best to have such report published in bulletin form. The report of the State Veterinarian also is sought for by all the Veterinarians of the State as well as by the keepers of abattoirs and dealers in meat supplies, persons who care little for the Department Report, and as a measure of economy in their distribution, it may be considered best that these reports shall be published in bulletin form, and if they should not appear in the Annual Department Report, persons wishing for specific information relating to the work of these two Divisions are referred to the Department bulletins spoken of, which will be issued if it is finally determined not to publish these two Division reports with the Annual Department Report.

Full information concerning the work of the Division of Farmers' Institutes and that of Economic Zoology will be found under the proper heads in the following pages.

It may not be amiss to say that the work of the four Divisions during the year has been characterized by persistent activity and fruitful of good results, meeting the hearty approval of the Head of the Department. The Farmers' Institute work under the proficient management of Director A. L. Martin is uniformly increasing in public favor. Farmers are realizing the importance of the instruction given at these meetings more and more every year, so that the demand for more institutes is constantly becoming greater. I would therefore recommend that the appropriation for this work be largely increased.

The work of the Division of Economic Zoology has been carried forward during the year with the energy and diligence that are distinguishing characteristics of Prof. H. A. Surface, Chief of the Division. As reports have been received of the devastation of growing crops by insect foes, information has been sent out giving instruction for the use of known remedies, and in cases where reports have come to the Department indicating that some new or unknown insect-pest has made its appearance, competent assistants have been sent out to make investigation. In many instances the investigations have been continued in the laboratory connected with this Division, the policy being not only to apply knowledge that has been

proven to be correct, but to discover new and more efficient means for the destruction of enemies whose habits are known, and to find out what may be learned of the life history of others that are not so well understood. This work is greatly appreciated by the farmers and fruit growers of the State, and as the demand for work of this character is constantly increasing, I deem it proper to call the attention of the General Assembly to its importance, and suggest that it be supported by liberal appropriation.

The work of the State Veterinarian has been in great demand during the year. Several outbreaks of Glanders among horses and mules have occurred, and in a number of instances he was called out to investigate diseases of livestock unfamiliar to the people of the community where they appeared, and to every call he responded with the promptness for which his work has been noted ever since his connection with the Department. The duties of the State Veterinarian combined with his work as Secretary and Executive officer of the State Livestock Sanitary Board, are more than a man even of Doctor Pearson's vigor and robust constitution should be expected to perform, and the work of his Division is so important, not only to the livestock interests of the State, but to the health of the public, that proper measures should be taken to provide for him the help so much needed. I would respectfully recommend that this matter receive the careful consideration of the General Assembly and that at the next biennial session an Assistant State Veterinarian and adequate clerical help be provided for this important Division.

The most important work committed to this Department is that of protecting the food supplies of the people of the State from adulteration, and the energy that has characterized the efforts of Dairy and Food Commissioner Warren to secure this result has been most commendable, receiving the approval of the Head of the Department and the public at large. The vigilance with which the Commissioner has administered the laws regulating the sale of oleomargarine and providing for pure dairy supplies is worthy of special mention, and has received from the farmers and dairymen of the State the approval it merits.

The Department did not during the year relax the energy with which the law regulating the sale of Feeding Stuffs was administered during the year 1905. It is unfortunate that so many comparatively worthless feeds should have found their way into the markets of the State. Farmers and others having the care of domestic animals have in recent years been greatly embarrassed to know what feeds may be relied upon as furnishing proper nutriment and at the same time being free from any deleterious or injurious effects upon the animals consuming them. The chemical and microscopic examination of the samples of feeds collected by the agents of the Department have revealed the fact that many of the mixed feeds having high sounding names are quite deficient in real feeding value, and in some instances contained substances detrimental to the health of animals. In every case, where there was found to be a clear violation of our Feeding Stuffs law, prosecutions were instituted and the effect of the vigorous crusade that has been kept up during the last two years has been to drive many of the more worth-

less and deceptive feeds from the markets of the State. It is worthy of note that comparatively few of the fraudulent and defective feeds were manufactured within our own State.

Among the samples collected by the agents of the Department, there were many that represented condimental feeds sold under the name of stock and poultry foods. An examination of these showed that they contained a small per cent. of feeding value which was usually derived from cottonseed or linseed meal, corn meal or other ground grain, to which was added wood-ashes, charcoal, sulphur, common salt, Epsom salts, coperas or iron oxide, crushed weed seeds and a small per cent. of powdered gentian and fenugreek seed.

The selling prices of these condimental feeds as reported by our agents, are entirely out of proportion to their real value.

If such articles are to be sold under names that indicate that they possess any feeding value, I regard it as important that they be placed under the same legal provisions regulating the sale of other feeding stuffs. The owners of livestock should be protected from the imposition they suffer at the hands of the compounders and vendors of all such materials, and I would commend such legislation to the consideration of the law makers of the State.

The work of Linseed Oil examination as provided for by Act of 23 April, 1901, was continued at intervals during the year, and it is gratifying to be able to repeat what was stated in last year's report, that a comparatively small per cent. of the samples examined were found to be adulterated. Of the 503 samples examined during the last two years, but 26, or 5 per cent. of the whole were adulterated. Owing to the large and constantly increasing purposes to which linseed oil is applied as used in paints and varnishes, as well as in the linoleum, rubber and soap industries, all of great importance to the citizens of the Commonwealth, it is important that these examinations shall continue to be made. The cost is quite small and is abundantly recompensed by the result of keeping the supply of this important commodity pure.

The examination by chemical analysis of the Commercial Fertilizers sold within the State received the attention that has been given it in the past. Fourteen agents were employed during both spring and fall sampling seasons, to gather in specimens of the fertilizers found upon the market, which were analyzed and results made public through the bulletins of the Department. While most of the fertilizers sold show a disposition upon the part of manufacturers to meet the guarantee they are required by law to file with this Department, it is to be regretted that in some instances (far too many) either carelessness or a desire to secure undue profits leads to abuses that ought to be corrected.

Section 5 of the Act of 25 March, 1901, commonly known as the Fertilizer Law, provides a penalty for furnishing a guarantee that is misleading or false, and makes it the duty of the Secretary of Agriculture to enforce the provisions of the act, but unfortunately the amount of money that may be used for this purpose after deducting the cost of securing samples and having the same analyzed, is not sufficient to cover the expense that must be incurred in prosecutions were brought in every instance where there is reason to believe that the action would be sustained by the courts. For this reason the

Department has been obliged to move with caution, and institute proceedings only in cases where a disposition to defraud seems plain. If an appropriation were made by the Legislature to sufficiently increase the funds now available for the enforcement of the law to warrant the employment of a general agent whose duty it should be to bring prosecutions, secure witnesses and attend hearings before local magistrates and follow cases where necessary into court, I have no doubt that in many instances the fertilizers upon the market would be greatly improved. Such legislation is recommended to the careful consideration of the General Assembly of the Commonwealth.

I desire also to renew the recommendation made in last year's report that manufacturers of fertilizers sold within the State be required to supplement the statement they now make concerning the fertilizing ingredients their products contain, by a statement of the sources from which such fertilizing ingredients are derived. This is something the farmer needs to know, in order that he may apply his fertilizers intelligently. The laws regulating the sale of fertilizers in some of the states, require this information to be given; and in a state like Pennsylvania where the amount expended for fertilizers runs into millions of dollars, this information ought not to be withheld.

Investigations have been made during the year, under the provision of the Act of March 13, 1895, relating to the following subjects: "Poultry in Pennsylvania," "Market Gardening," and "Fruits of Pennsylvania."

The changing conditions in the agriculture of the State is directing the attention of many of our farm people to subjects of this kind, and in each instance, a successful specialist in his particular line, whose premises were visited and whose operations were carefully scrutinized by the Head of the Department, was employed to make the investigation and prepare a bulletin for the information of the public, giving the result of his investigation and his methods of operation.

Other bulletins published during the year are "Proceedings of the 29th Annual Meeting of the State Board of Agriculture," "Concentrated Feeding Stuffs of Pennsylvania," "List of Local Agricultural Fairs for 1906," "Report of Bee-Keepers Association," "Analysis of Commercial Fertilizers, Spring Samples for 1906," "Farmers Institutes in Pennsylvania, 1906-1907," "Proceedings of Spring Meeting of State Board of Agriculture and Farmers Normal Institute," and "Analysis of Fall Samples of Commercial Fertilizers."

For all these bulletins as well as all the bulletins issued by the Department from its organization to the present time, there is a great demand not only from the citizens of our own State, but from other states as well as foreign countries. It is a matter for regret that in the early years of the existence of the Department, before the value of these bulletins had become to be fully appreciated by the public, the number that could be legally published was entirely too small, so that the supply of many of them is quite, or nearly, exhausted, and yet the demand for them continues. With the increased number that may be published under the Act of 1903, the supply is still insufficient to meet the demand, and I would re-

spectfully suggest the propriety of providing for the publication of a greater number of each new bulletin and the publication of new editions of such of the numbers that are exhausted, as in the judgment of the Secretary may be deemed proper.

In order to comply with your expressed desire that the cost of public printing shall be kept as low as is at all consistent with the good of the public service, I have endeavored to make this personal report as brief as possible; and to meet the expressed view of the Attorney General's Department, as to what may be lawfully included in this report, I have been obliged to leave out much important matter that has heretofore appeared in the Annual Report of this Department. I regret that under the law, as it now is, I am unable to include with this report the entire proceedings of State Associations, organized for the advancement of the interests of agriculture in its several branches, and that I can only give abstracts of such proceedings.

The essays read at Farmers' Institutes contain much valuable information for farmers of the State, and it is only because I am informed that they cannot legally be published that they have been left out. I hope, however, to be able to preserve at least some of these by publishing them in bulletin form.

The elimination of the matter referred to will diminish the size of the Report, as well as its value to the Agriculture of the State, but it is hoped that the saving to the Commonwealth in the item of printing, may in some measure compensate this loss.

I wish, in conclusion, to express my appreciation of the assistance and counsel your Excellency has so cheerfully and promptly given me whenever called upon. I desire also in this public manner to acknowledge the help given by the agricultural as well as the public press of the State, by encouraging every attempt to attain better methods and secure more satisfactory results.

I have the honor to be,

Very truly yours,

A handwritten signature in cursive script, reading "A. B. Britchfield". The signature is written in dark ink and is positioned above the typed name.

Secretary of Agriculture.

TWELFTH ANNUAL REPORT OF THE DIVISION OF FARMERS' INSTITUTES FOR THE YEAR 1905-6.

HARRISBURG, PA., *January 1, 1907.*

To the Honorable N. B. Critchfield, *Secretary of Agriculture:*

Sir: I have the honor to present herewith the Twelfth Annual Report of the Division of Farmers' Institutes.

During the Institute year ending June 1, 1906, the institutes held in Pennsylvania have been more than usually successful. Increased attendance can only be ascribed to the growing interest of the farmers and the desire for a higher knowledge of the many important lessons relating to the most approved methods to be adopted, which are so essential in order to successfully engage in agricultural pursuits. When we remember that our institutes are held at a season of the year (in the winter) when heavy snows and severe storms prevail, the large attendance is the more remarkable, since the aged and infirm are on this account prevented from attending. Too much credit can not be given our corps of County Institute Chairmen, whose work is largely voluntary in its character. By their untiring efforts suitable places for holding meetings are procured, programs prepared, local committees organized and all arrangements completed for holding the institutes. The entire work is completed on a basis of a sum not exceeding \$12.50 per day for every day of institute held within a given county. Some changes have been made in the corps of Institute Lecturers. This is made necessary by the calls coming from other states for a number of our efficient lecturers, others by reason of age or business demands upon their time have been compelled to decline work; however, we are proud to say that our plan of encouraging persons to take part in the program as local institute instructors has developed an army of very satisfactory workers from which to fill our ranks from year to year as necessity would seem to demand.

The demand for two-day meetings is on the increase. At all two-day meetings five sessions are held, educational topics are placed upon program for one of the evening sessions and the assistance that is freely rendered by most of the County Superintendents of the Public Schools is deserving of more than a passing mention. These leading educators are an important force in directing the attention of the farmers to the importance of the Centralized Township Schools and Township High Schools, as in my judgment no one thing would so rapidly develop the strong, but in many instances latent faculties of our country children than the graded centralized school. In these schools lessons should be taught on Soil Building, Plant Growth, Animal Husbandry, Birds, Insects, etc., in fact the entire range of natural things, thus equipping the farmers' children for a more efficient and intelligent direction of farm operations and at the same time broadening and elevating the

standard of Agriculture. At the second evening session topics relating to the Country Home are presented. Indeed what subject is fraught with greater possibilities to the State than that of the Farm Homes of Pennsylvania. Their sanitary conditions, surroundings, the social problems, such as make life in the country pleasant and desirable, for without well established country homes owned by the occupants and adorned by a queenly crowned mother surrounded with loving family circle, the State can not hope to long continue its imperial strength and greatness. The day sessions are devoted to practical and scientific questions relating to the Soils, their formation, physical condition, productive possibilities, how to best grow the various farm crops and those best adapted to the different soils and market demands; also the nature of Plant Life and Growth, its intricate lessons shown forth in leaf stalk and root. Possibly greater interest was developed the past season in Corn Breeding and Cultivation than in that of any other cereals. Lessons given in the selection of seed, manner of planting, cultivation and harvesting this golden crop have developed a determination among the farmers to grow a quality of corn better adapted to the requirements of the animals kept upon our farms. We are learning that by careful selection of seed, that expensive ingredients entering so largely into all our Feeding Stuffs, Protein, etc., can be increased many per cent. by planting seed having in its grains a well developed germ and containing a large proportion of protein, by discarding seed deficient in the protein-content from year to year, the farmers can with certainty expect to grow from the corn crop a feed approaching very near to a balanced ration for their animals. Indeed, as a result of Farmers' Institute teaching, the Pennsylvania farmer is rapidly approaching the period when he will grow upon his farm the different nitrogen-gathering plants and legumes rich in protein, and corn laden with an increased quantity of protein within its kernels to make a palatable and balanced ration for his animals, without having to resort to the most costly and sometimes dangerous method, that of purchasing the high priced and sometimes deleterious compounds placed on the market as animal foods.

Our course of instruction would be incomplete unless attended by a competent corps of Dairy Instructors, since in no other line of animal industry is there so great an investment of capital or so many different problems to solve, embracing the dairy herd, breed and management, feed, care of milk, butter making, the making of cheese, the demand for not only accurate teaching, but actual demonstration in testing milk for its purity and actual butter fat-content, ripening of cream and complete process of churning, working the butter, marking, scoring and naming the points of excellence which it contains. Meetings of this kind wherever held have proved eminently useful to the dairyman and calls for such demonstrations are reaching us from many counties of the State. By this demonstrative method of instruction, we are rapidly weeding out the unprofitable dairy cow, the more profitable dairy herds in Pennsylvania yielding 350 lbs. of butter per year, whilst the poorer herds yield but little in excess of 150 lbs. per year, thus we note the margin of difference in yield is a wide one and the practical work of the Institute Division is to eliminate from the dairy herd the profitless 150 lbs. cow and place in her stead the 350 lbs. cow. We are proud to

state that we stand a close second in the value of our Dairy Cows, the amount being \$37,647,337.

Pennsylvania is naturally a tree-growing State, indeed our great founder named in "Penn's Woods." This being true, special attention is given to Horticulture and Pomology by reason of our favorable soil conditions, abundance of moisture, suitable attitudes and unexcelled home markets. Special instruction is given in the selection of a location, preparation of soil, selecting trees and varieties; their planting and care and marketing the fruit. I feel safe in saying that Pennsylvania is destined to be the leading apple growing state of the Union, because of her soil, climate and all favoring conditions prevailing within every county of the State. Not only so, but in no other line of operation is there a greater promise of large profits to the persons who adopt modern and approved methods in the management of their orchards. In fact the farmer of today who would bring success to his calling must, of necessity, bring to bear in his operations the light and truth which men of science have developed within the last generation. He can no longer pursue wornout and unprofitable methods; he will discard the unprofitable dairy cow; keep on his farm pure bred stock of all kinds; be a grower of fruit for market and home consumption and bring to bear upon the community the highest order of intelligence in his farm work.

The past year marked the high water mark in Institute work, in that there were held a greater number of institutes with increased interest manifested and attendance, 165,553, which is greater than any past year. Of the future we can only say that the demand for meetings more than double that we can supply with the funds provided us. Our Annual Roundup was held at Clearfield on May 29-31, proceedings of this meeting having been placed in bulletin form and has been widely distributed. These meetings are accomplishing much towards concentrating the work of our lecturers and crystalizing their efforts upon the more important truths and advanced teaching in agricultural chemistry and botany, animal and plant breeding, seed selection, etc. When agriculture prospers, all other industries advance, when agriculture languishes, panic threatens all other commercial and manufacturing interests. Agriculture of today can only advance by intelligent directed effort; first, careful thought, after which working out that thought in actual farm work. The Farmers' Institutes are working for the Pennsylvania farmer in a field occupied by no other organization, conveying to him lessons intended to give strength and stability as a farmer and citizen. Program of this meeting is embraced in this report.

The following is a complete outline of the institutes held during the past year, giving places where held, dates and number of sessions; also attendance by sessions, three State speakers attending all the meetings. These meetings were held at a cost of less than \$40.00 per day, and challenge competition from any source when we remember that hall rent, programs, all local management, hotel and travelling expenses and per diem pay of all the State speakers is embraced in this statement:

The following is a complete list, by counties, of dates and places where institutes were held during the fiscal year. There were held a total of 393 days of institute, divided into 987 sessions. The attendance by sessions in the different counties will make a grand total of 165,583 persons who attended farmers' institutes, season of 1905-6.

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1905-1906.

County.	Place.	Date.	Days of Institute.	Number of sessions.	Attendance by Sessions.		Speakers Present.	Attendance.		By counties.
					State.	Local.		Average.	Total.	
Adams,	York Springs,	Dec. 18-19,	2	2	60, 400, 55, 75, 400,	1	3	198	990	
Allegheny,	Arendtsville,	Dec. 20-21,	2	5	50, 200, 55, 100, 200,	3	3	101	505	1,870
	East Berlin,	Dec. 22-23,	2	5	50, 200, 50, 75, 375,	3	3	75	375	
	Imperial,	Jan. 3-4,	2	5	38, 61, 77, 80, 220,	2	2	95	476	
Armstrong,	Bridgeville,	Jan. 5-6,	2	5	118, 420, 60, 250, 460,	4	4	260	1,308	2,875
	Elizabeth,	Jan. 8-9,	2	5	30, 30, 500, 120, 250,	3	3	126	630	
	New Texas,	Jan. 10,	2	5	71, 150, 240,	2	2	124	620	
Beaver,	Apollo,	Jan. 11-12,	2	3	72, 250, 225, 210, 370,	3	3	128	384	
	Neale,	Jan. 13,	1	2	87, 300, 109, 210, 180,	3	3	199	996	3,623
	Dayton,	Jan. 17-18,	1	2	90, 170, 350, 160, 340,	3	3	212	1,210	
Bedford,	Elderton,	Dec. 18-19,	2	5	58, 100, 152, 225, 58,	4	4	75	150	
	North Savickley,	Dec. 20-21,	2	5	26, 75, 37, 40, 80,	3	3	119	593	991
	Manschoice,	Feb. 16-17,	2	4	55, 230, 180, 200,	3	3	181	725	
Berks,	Salemville,	Feb. 19-20,	2	5	73, 88, 228, 210, 240,	3	3	168	839	2,598
	Woodbury,	Feb. 21-22,	2	5	76, 63, 135, 180, 550,	3	3	207	1,034	
	Blendon,	Feb. 19-20,	2	5	69, 200, 50, 100, 400,	4	4	163	815	
Blair,	Wernersville,	Feb. 21-22,	2	5	65, 120, 50, 100, 300,	4	4	127	635	
	Rehersburg,	Feb. 23-24,	2	5	60, 130, 25, 120, 220,	4	4	117	585	
	Gelertown,	Feb. 26,	1	3	35, 210, 200,	2	2	148	436	3,105
Bradford,	Mohrsville,	Feb. 27,	2	3	35, 15, 350, 55, 300,	4	4	171	855	
	Williamsburg,	Feb. 28-29,	2	3	85, 140, 100, 150, 250,	3	3	173	520	2,190
	East Freedom,	Feb. 30,	2	5	140, 200, 350, 350, 400,	3	3	163	815	
Canton,	LeRoyville,	Jan. 1-2,	2	5	75, 100, 50, 100, 100,	3	3	85	425	
	Durell,	Jan. 3-4,	2	5	90, 120, 100, 140, 125,	3	3	115	575	
	Franklindale,	Jan. 5-6,	2	5	150, 150, 125, 200, 125,	4	4	510	750	8,815
Columbia X Roads,	Canton,	Jan. 8-9,	2	5	75, 100, 100, 175, 175,	2	2	125	625	
	Columbia X Roads,	Jan. 10,	2	5		3	3			

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1905-1906—Continued.

County.	Place.	Date.	Days of Institute.	Number of sessions.	Attendance by Sessions.			Speakers Present.	Attendance.		
					State.	Local.	Average.		Total.	By counties.	
Bucks,	Ridgboro,	Jan. 29-30,	2	5	120, 250,	125, 320, 400,	219	1	1,245		
	Lansborne,	Jan. 21-Feb. 1,	12	5	250, 350,	200, 190, 700,	420	1	2,160		
	Springtown,	Feb. 2-3,	2	5	127, 200,	75, 250, 450,	238	4	1,192		
Butler,	Pineville,	Feb. 5-6,	2	5	123, 300,	210, 290, 500,	286	1	1,428		
	Painsteadtville,	Feb. 7-8,	2	3	192, 25, 70,	215, 510,	313	1	928		6,901
	Eau Claire,	Nov. 27-28,	2	4	125, 250,	225, 400,	563	3	1,000		
	Conococheessing,	Nov. 28-30,	3	4	110, 350, 50,	100, 300,	1,000	3	1,000		
	Prospect,	Dec. 1-2,	2	5	80, 130, 300,	190, 290, 325,	70	10	70		2,743
Cambria,	Carlisle,	Feb. 2-3,	2	6	110, 260,	575, 190, 575,	163	4	1,175		
	St. Augustine,	Feb. 5-8,	4	6	65, 200,	35, 65, 175,	432	2	2,510		4,175
Cameron,	Emporium,	Feb. 9-10,	2	5	25, 125,	13, 50, 175,	103	3	515		
	Driftwood,	Feb. 12-12,	2	5	15, 200,	15, 55, 175,	78	3	388		903
Carbon,	New Mahoning,	Jan. 19-20,	2	3	35, 175,	35, 75, 225,	96	3	290		780
	Weatherly,	Jan. 22,	1	5	60, 180, 300,	150, 225, 300,	109	3	545		
Centre,	Phillipsburg,	Nov. 28-29,	2	3	100, 200,	100, 150, 200,	186	4	1,115		
	Pleasant Gap,	Nov. 30,	1	5	100, 200,	100, 150, 200,	215	1	1,075		2,029
Chester,	Russellville,	Dec. 2-3,	2	5	125, 225,	35, 125, 225,	130	2	1,750		
	Downingtown,	Feb. 5-6,	2	5	125, 225,	35, 125, 225,	305	1	1,750		
	Byers,	Feb. 7-8,	2	5	125, 225,	35, 125, 225,	153	3	1,750		4,175
Charlton,	Bedfordville,	Feb. 9-10,	2	5	55, 200,	75, 75, 140,	153	1	688		
	Leatherswood,	Feb. 29-31,	3	5	145, 300,	130, 250, 350,	108	2	315		
	Laurel,	Feb. 23-24,	2	5	75, 150,	75, 115, 125,	225	3	1,175		2,853
Clearfield,	Tylerburg,	Feb. 14-15,	2	5	60, 75,	200, 125, 200,	108	3	540		
	Lumber City,	Feb. 14-15,	2	5	35, 35,	35, 85,	115	3	345		1,545
Clinton,	Clearfield,	Mar. 1,	1	5	35, 45,	200, 80, 300,	112	3	660		
	Lamar,	Dec. 4-5,	2	5	20, 55,	100, 65, 200,	96	1	480		1,140
	McElhattan,	Dec. 6-7,	2	5	40, 50,	40, 45, 60,	235	2	47		735
(Special),	Roseburg,	Feb. 6-7,	2	5	50, 130,	60, 190, 200,	165	3	520		
	Woodrich,	Feb. 8-9,	2	5							

Columbia.	Millville	Jan. 31-Feb. 1.	5	250, 700, 225, 450, 600,	4	1	190	950
	Orangeville	Feb. 2-3.	5	150, 400, 200, 200, 200,	4	2	229	1,375
	Beaver Valley	Feb. 4-5.	5	28, 250, 80, 125, 275,	4	1	151	758
Crawford.	Adamsville	Jan. 6.	5	86, 129, 70, 100, 163,	4	1	63	190
	Conneautville	Jan. 8-9.	5	200, 402, 156, 215, 700,	4	3	123	614
	Black Ash	Jan. 10-11.	5	129, 275, 225, 275, 300,	4	4	204	1,522
	Litholville	Jan. 12-13.	5	140, 252, 32, 190, 181,	3	2	241	1,204
	Hogestown	Jan. 15-16.	5	60, 85, 80, 500,	3	3	172	858
Cumberland.	Churchtown	Nov. 27-28.	4	60, 60, 60, 190, 200,	3	1	108	425
	Jacksonville	Nov. 28-29.	3	30, 300,	3	1	165	429
	Plainfield	Nov. 30.	3	30, 100, 200, 100,	3	2	183	620
	Middle Spring	Dec. 1.	3	30, 100, 200, 100,	3	2	183	620
Delaware.	Madawville	Dec. 2.	4	60, 300, 20, 200,	3	1	162	800
	Conradville	Jan. 18-20.	4	35, 200, 60, 100, 300, 200, 200,	3	2	177	1,265
Dauphin.	Landstown	Jan. 20-21.	3	50, 270, 50, 50, 225,	5	1	125	625
	Berrystown	Jan. 22-23.	3	75, 150, 75, 100, 150,	3	1	110	350
	Hershey	Feb. 11-12.	4	75, 90, 125, 125, 175,	4	1	47	140
Elk.	St. Marys	Feb. 16-17.	5	40, 50, 50, 85, 65,	3	1	118	590
	Russelas	Feb. 19-20.	4	300, 225, 210, 600, 700,	3	1	60	240
Erie.	North East	Feb. 17-18.	4	170, 300, 170, 225, 350,	3	1	129	2,115
	Fairview	Jan. 19-20.	4	80, 200, 190, 230, 270,	4	8	263	1,315
	Summit Hill	Jan. 20-21.	4	110, 250,	4	3	196	980
Payette.	New Haven	Jan. 31.	4	31, 57, 31, 48, 67,	4	1	212	635
	Salmon	Dec. 1-5.	3	28, 125, 112, 50, 170,	3	3	98	291
	Salisbury	Dec. 6-7.	3	22, 18, 30, 24, 100,	3	3	92	290
Forest.	East Hickory	Dec. 8-9.	3	22, 18, 30, 24, 100,	3	10	51	329
	West Hickory	Dec. 10.	3	25, 50, 105,	3	1	54	162
	Tionesta	Feb. 9-10.	3	50, 170, 45, 80, 200,	3	2	60	181
Franklin.	Ortstown	Dec. 4-5.	3	50, 300, 60, 75, 300,	3	4	109	545
	St. Thomas	Dec. 6-7.	3	50, 300, 65, 75, 300,	3	1	157	785
	Payetteville	Dec. 8-9.	3	60, 400, 50, 50, 350,	3	1	158	790
Fulton.	McConnellsburg	Nov. 28.	5	45, 152, 48, 55, 270,	3	1	182	910
	Fort Littleton	Nov. 30-Dec. 1.	5	20, 75, 20, 50, 192,	3	1	118	500
Greene.	Rogersville	Dec. 18-19.	5	78, 88, 273, 295, 287,	3	1	73	363
	Whitely Chapel	Dec. 20.	3	30, 34, 105, 112, 160,	3	2	88	339
	Jefferson	Dec. 21-22.	3	34, 37, 112, 80, 160,	3	2	86	432
Huntingdon.	Saltillo	Dec. 23.	3	21, 112,	3	2	68	136
	W.C. Smith	Dec. 24-25.	3	10, 130, 8, 11, 112,	3	1	61	137
	McConnellsburg	Dec. 26-27.	3	190, 300, 228, 280, 430,	3	4	280	1,448
Indiana.	Penn Run	Jan. 19-20.	3	180, 300, 228, 280, 430,	3	4	282	1,800
	Purchase Line	Jan. 20-21.	8	180, 130, 230, 230, 275,	3	1	231	1,155
Jefferson.	Hazlet	Feb. 1-2.	5	115, 200, 100, 175, 290,	3	3	168	840
	Hamtown	Feb. 21-22.	5	125, 150, 200, 175,	3	2	162	650
	Paradise	Feb. 23-24.	5	75, 150, 250, 165, 225,	3	6	172	805
	Oliveburg	Feb. 25.	4	75, 225, 87, 125, 230,	3	3	85	170
Junata.	McCoyville	Feb. 26-27.	5	10, 75, 165,	3	2	158	740
	Honey Grove	Dec. 22.	5	45, 250, 32, 100, 240,	3	3	73	229
	McAllisterville	Dec. 27-28.	5	60, 130, 240,	3	1	125	627
Lackawanna.	Baldmont	Nov. 29.	3	45, 50, 175,	4	1	127	380
	Said Mount	Nov. 30.	3	45, 50, 175,	4	1	127	380
	Thompsonville	Nov. 30.	3	45, 50, 175,	4	1	127	380

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1905-1906—Continued.

County.	Place.	Date.	Days of institute.	Number of sessions.	Attendance by Sessions.			Speakers Present.	Attendance.	
					Local.	Average.	Total.			
Westmoreland.	Rileysville.	Dec. 29.	1	3	4	107	322			
	Calkins.	Dec. 30.	1	3	4	104	304			
	Beech Creek.	Jan. 1.	1	3	4	138	415			
	Bethany.	Jan. 2.	1	3	4	154	463			
	Georgetown.	Jan. 3.	1	3	4	30	270			
	Greensburg.	Nov. 28.	1	3	3	17	52			2,779
Wyoming.	Ligonier.	Nov. 29.	1	3	3	9	19			
	Pleasant Unity.	Nov. 30-Dec. 1.	2	3	3	45	183			
	Harrison City.	Dec. 2.	1	3	3	23	46			
	Tunkhannock.	Dec. 18-19.	2	4	3	307	1,400			
	Falls.	Dec. 20.	1	3	3	142	425			
	Nicholson.	Dec. 21-22.	2	4	3	162	648			1,213
York.	Delft.	Dec. 23.	1	3	3	132	516			
	Airville.	Dec. 29-30.	2	4	3	66	330			
	Novover.	Jan. 1-2.	2	5	3	169	890			
	Unionville.	Jan. 3-4.	2	5	3	229	1,140			
	Lewisburg.	Jan. 5-6.	2	5	3	1	3			3,003
	Total.		393	987	771	369	165,563			

FARMERS' ANNUAL NORMAL INSTITUTE.

HELD AT CLEARFIELD, PA., MAY 28-31, 1906.

PROGRAM

First session convenes Tuesday Afternoon, May 29, 1906.

J. W. NELSON, Shawville, Pa., Chairman.

Call to order 2.00.

Address of welcome, by Hon. Allison O. Smith, Clearfield, Pa., to which a response will be made by members of the convention.

1. "ANATOMY, PHYSIOLOGY, CARE AND TREATMENT OF FARM ANIMALS." (40 minutes, and 20 minutes for questions.)

Dr. E. E. Tower, Hop Bottom, Pa.

2. "THE COMMERCIAL ORCHARD AS A BUSINESS." (30 minutes, and 20 minutes for questions.)

Dr. J. H. Funk, Boyertown, Pa.

Tuesday Evening, May 29, 1906.

HON. JASON SEXTON, North Wales, Pa., Chairman.

Call to order 7.30.

1. "GOOD SEED AND HOW TO OBTAIN IT; ADULTERATED SEED." (40 minutes, and 20 minutes for questions.)

Prof. J. W. T. Duvel, U. S. Department of Agriculture, Washington, D. C.

2. "DOMESTIC SCIENCE OF FARM HOMES." (40 minutes, and 20 minutes for questions.)

Mrs. T. E. Orr, Beaver, Pa.

3. "ACCUMULATION OF SOIL NITROGEN." (40 minutes, and 20 minutes for questions.)

Prof. J. W. Harshberger, University of Pennsylvania, Philadelphia, Pa.

Wednesday Morning, May 30, 1906.

J. S. BURNS, Imperial, Pa., Chairman.

Call to order 9.00.

1. "WHAT CHEMISTRY IS DOING FOR THE FARM." (40 minutes, and 20 minutes for questions.)

Prof. Wm. G. Owens, Bucknell University, Lewistown, Pa.

2. "SOIL IMPROVEMENT." (50 minutes, and 30 minutes for questions.)

Prof. W. F. Massey, editor, The Practical Farmer, Philadelphia, Pa.

Wednesday Afternoon, May 30, 1906.

A. P. YOUNG, Millville, Pa., Chairman.

Call to order 1.30..

1. "ROUND-UP SESSION DEVOTED TO MATTERS RELATING TO LOCAL INSTITUTE MANAGEMENT, AND A GENERAL OUTLINE OF THE WORK FOR THE COMING SEASON." (40 minutes.)

Discussion opened by A. L. Martin,
Director of Institutes.

Note.—This address to be followed by general conference, and five minutes talks from County Chairman and Institute Lectures.

Wednesday Evening, May 30, 1906.

T. E. ORR, Beaver, Pa., Chairman.

Call to order 7.30.

1. "MEMORIAL DAY." (30 minutes.)

Mrs. M. A. Wallace, Ellwood City, Pa.

2. "THE BREEDING OF POULTRY FOR EGG PRODUCTION: HOUSING, CARE AND MANAGEMENT." (Illustrated by lantern slides.) (One hour, and 30 minutes for questions.)

Prof. James E. Rice, in Charge of
Poultry Husbandry, Cornell University, Ithaca, N. Y.

3. "BEE KEEPING." (Illustrated by lantern slides.) (40 minutes, and 20 minutes for questions.)

Prof. H. A. Surface, Economic Zoologist, Harrisburg, Pa.

Thursday Morning, May 31, 1906.

J. NEWTON GLOVER, Vicksburg, Pa., Chairman.

Call to order 9.00.

1. "ON WHAT DO THE DAIRY PROFITS DEPEND." (40 minutes, and 20 minutes for questions.)

Prof. H. E. Van Norman, Department
of Dairy Husbandry, State College.

2. "FEED, BREED AND CARE OF THE DAIRY." (40 minutes, and 20 minutes for questions.)

Dr. J. D. Detrich, West Chester, Pa.

3. "THE ENFORCEMENT OF THE DAIRY AND FOOD LAWS." (40 minutes, and 20 minutes for questions.)

Dr. B. H. Warren, Dairy and Food
Commissioner, Harrisburg, Pa.

Thursday Afternoon, May 31, 1906.

I. A. ESCHBACH, Milton, Pa., Chairman.

Call to order 1.30.

1. "SOIL IMPROVEMENT WITHOUT STABLE MANURES." (40 minutes, and 20 minutes for questions.)

Prof. R. L. Watts, Scalp Level, Pa.

2. "ECONOMY IN BEEF PRODUCTION." (40 minutes, and 20 minutes for questions.)

Prof. T. I. Mairs, State College, Pa.

LIST OF COUNTY INSTITUTE MANAGERS FOR SEASON OF 1905-6.

County.	Name and Address of Chairman.
Adams,	A. I. Weidner, Arendtsville.
Allegheny,	J. S. Burns, Imperial, R. F. D. No. 1.
Armstrong,	S. S. Blyholder, Neale.
Beaver,	A. L. McKibben, New Sheffield.
Bedford,	S. S. Diehl, Bedford.
Berks,	Howard G. McGowan, Geiger's Mills.
Blair,	H. L. Harvey, Kipple.
Bradford,	E. E. Chubbuck, Rome, R. F. D. No. 16.
Bucks,	Watson T. Davis, Ivyland.
Butler,	W. H. H. Riddle, Butler.
Cambria,	H. J. Krumenacker, Nicktown.
Cameron,	W. H. Howard, Emporium.
Carbon,	J. A. Werner, Weatherly.
Centre,	John A. Woodward, Howard.
Chester,	Dr. M. E. Conard, Westgrove.
Clarion,	S. X. McClellan, Knox.
Clearfield,	J. W. Nelson, Shawville.
Clinton,	Joel A. Herr, Millhall, R. F. D.
Columbia,	A. P. Young, Millville.
Crawford,	M. W. Oliver, Conneautville.
Cumberland,	Rev. J. F. Ferguson, Mechanicsburg.
Dauphin,	S. F. Barber, Harrisburg.
Delaware,	J. Milton Lutz, Llanerch.
Elk,	John B. Werner, St. Marys.
Erie,	Archie Billings, Edinboro.
Fayette,	Sylvester Duff, Smock.
Forest,	C. A. Randall, Tionesta.
Franklin,	C. B. Hege, Marion.
Fulton,	R. M. Kendall, McConnellsburg.
Greene,	J. W. Stewart, Jefferson.
Huntingdon,	Geo. G. Hutchison, Warriors' Mark.
Indiana,	S. M. McHenry, Indiana.
Jefferson,	W. L. McCracken, Brookville.
Juniata,	Matthew Rodgers, Mexico.
Lackawanna,	Henry W. Northup, Dalton, R. F. D. No. 1.
Lancaster,	W. H. Brosius, Drumore.
Lawrence,	Samuel McCreary, Volant, R. F. D.
Lebanon,	Edwin Shuey, Lickdale.
Lehigh,	P. S. Fenstermaker, Allentown.
Luzerne,	J. E. Hildebrant, Dallas, R. F. D. No. 2.
Lycoming,	A. J. Kahler, Hughesville.
McKean,	L. W. Howden, Coryville.
Mercer,	W. C. Black, Mercer.
Midlin,	M. M. Naginey, Milroy.
Monroe,	Randall Bishing, East Stroudsburg.
Montgomery,	Jason Sexton, North Wales.
Montour,	C. A. Wagner, Ottawa.
Northampton,	Wm. F. Beck, Easton, R. F. D. No. 1.
Northumberland,	I. A. Eschbach, Milton, R. F. D. No. 1.
Perry,	A. T. Holman, Millerstown.
Philadelphia,	Edwin Lonsdale, Girard College, Phila. J. B. Kirkbride, Bustleton.
Pike,	B. F. Killam, Papanack.
Potter,	Horace H. Hall, Ellishburg.
Schuylkill,	W. H. Stout, Pinegrove.
Snyder,	Charles Miller, Salem.
Somerset,	Jacob S. Miller, Friedens.
Sullivan,	J. K. Bird, Dushore, R. F. D. No. 3.
Susquehanna,	Dr. E. E. Tower, Hop Bottom.
Tioga,	F. E. Field, Wellsboro.
Union,	J. Nelson Glover, Vicksburg.
Venango,	W. A. Crawford, Cooperstown.
Warren,	George A. Woodside, Sugargrove.
Washington,	D. S. Taylor, Raccoon.
Wayne,	W. E. Perham, Niagara.
Westmoreland,	M. N. Clark, Claridge.
Wyoming,	D. A. Knuppenburg, Lake Carey.
York,	G. F. Barnes, Rossville.

LIST OF INSTITUTE LECTURERS FOR SEASON OF 1905-6.

Barber, S. F., Box 104, Harrisburg, Dauphin county.
 Barclay, Richard D., Haverford, Montgomery county, Pa.
 Bashore, Dr. Harvey B., West Fairview, Cumberland county, Pa.
 Beardslee, R. L., Warrenham, Bradford county, Pa.
 Black, W. C., Mercer, Mercer county, Pa.
 Bond, M. S., Danville, Montour county, Pa.
 Brodhead, C. W., Montrose, Susquehanna county, Pa.
 Bruckhart, J. W., Lititz, Lancaster county, Pa.
 Burns, J. S., Imperial, R. F. D. No. 1, Allegheny county, Pa.
 Butz, Prof. Geo. C., State College, Centre county, Pa.
 Campbell, J. T., Hartstown, Crawford county, Pa.
 Clark, M. N., Claridge, Westmoreland county, Pa.
 Cooke, Prof. Wells W., 1328 Twelfth street, N. W., Washington, D. C.
 Cox, John W., New Wilmington, Lawrence county, Pa.
 Cure, Z. T., Jermyn, Lackawanna county, Pa.
 Detrich, J. D., West Chester, R. F. D. No. 12, Chester county, Pa.
 Drake, W. M. C., Volant, Lawrence county, Pa.
 Duval, Prof. J. W. T., Acting Botanist in charge of Seed Laboratory, U. S. Department of Agriculture, Washington, D. C.
 Ellis, David M., Bridgeport, Montgomery county, Pa.
 Funk, Dr. J. H., Boyertown, Berks county, Pa.
 Hall, Horace H., Ellisburg, Potter county, Pa.
 Harshberger, J. W. Ph. D., 737 Corinthian avenue, Philadelphia, Pa.
 Herr, Joel A., Millhall, R. F. D., Clinton county, Pa.
 Hill, W. F., Chambersburg, Franklin county, Pa.
 Hoover, Hon. E. S., Lancaster, Lancaster county, Pa.
 Hull, Geo. E., Transfer, R. F. D., Mercer county, Pa.
 Kahler, Hon. A. J., Hughesville, Lycoming county, Pa.
 Kester, R. P., Grampian, Clearfield county, Pa.
 Ledy, J. H., Marion, Franklin county, Pa.
 Lehman, Fayetteville, Franklin county, Pa.
 Lesh, N. M., Sciota, Monroe county, Pa.
 Lighty, East Berlin, Adams county, Pa.
 Menges, Prof. Franklin, York, York county, Pa.
 McDowell, Prof. M. S., State College, Centre county, Pa.
 Northup, Hon. Henry W., Dalton, R. F. D. No. 1, Lackawanna county, Pa.
 Orr, T. E., Beaver, Beaver county, Pa.
 Orr, Mrs. T. E., Beaver, Beaver county, Pa.
 Owens, Prof. Wm. G., Lewisburg, Mifflin county, Pa.
 Peachey, J. H., Belleville, Mifflin county, Pa.
 Philips, Hon. T. J., Atglen, Chester county, Pa.
 Sampson, Prof. H. O., Waterford, Erie county, Pa.
 Schock, Oliver D., Assistant Dairy and Food Commissioner, Harrisburg, Pa.
 Schwarz, Hon. R. F., Analomink, Montgomery county, Pa.
 Seeds, R. S., Birmingham, Huntingdon county, Pa.
 Stout, W. H., Pinegrove, Schuylkill county, Pa.
 Stuart, R. R., Callensburg, Clarion county, Pa.
 Tower, Dr. E. E., Hop Bottom, Susquehanna county, Pa.
 Thayer, Dr. I. A., New Castle, Lawrence county, Pa.
 Wagner, F. J., Harrison City, Westmoreland county, Pa.
 Wallace, Mrs. Mary A., Ellwood City, Lawrence county, Pa.
 Watts, Prof. R. L., Scalp Level, Cambria county, Pa.
 Watts, D. H., Kermoor, Clearfield county, Pa.
 Waychoff, G. B., Jefferson, Greene county, Pa.

The following is a list of Lecturers, Speakers and Essayists who gave instruction at institutes season of 1905-6, giving list of topics discussed as well as biographical sketches of their lives.

1905-1906.

BARBER, S. F., P. O. Box 104; Harrisburg, Dauphin County, Pa.:

1. **THE SILO THROUGHOUT THE YEAR.**

Takes place of summer pasturage. Advantage and economy over old system of soiling. Cost of machinery for filling.

2. **BUTTER-MAKING ON THE FARM.**

Proper appliances. Sanitary conditions. Ripening of cream. Proper temperature for churning. How to put it into marketable shape.

3. **CARE OF STABLE MANURE AND HOW BEST TO APPLY IT.**

Advantage of immediate use, which saves loss of from 30 to 50 per cent. Produces better result.

4. **SEEDING OF GRASS FOR HAY.**

Preparation of the seed bed. Quantity of seed. The best mixture. When and how to seed.

5. **CARE OF MILK FOR THE RETAIL TRADE.**

Cleanliness. Removing animal heat. Handling of all milk in sterilized utensils.

6. **MARKETING OF FARM CROPS.**

The controlling of prices by marketing as consumption requires and not dumping upon the market the whole crop at one time.

BARCLAY, RICHARD D., Haverford, Montgomery County, Pa.:

1. **BEE-KEEPING.** (60 minutes).

A general discussion of the economy of the bee; its horticultural value; methods for the control of swarming. Management for honey production. Wintering, enemies and diseases.

2. **HONEY.** (15 minutes.)

Its sources, production, care and use. A discussion of honey as a food. How it is prepared by the bees. Where and how it should be stored. A word regarding adulteration of so-called manufactured honey.

3. **QUEEN REARING FOR LOCAL USE AND COMMERCIAL-
LY.** (25 minutes.)

A discussion of methods by which a small bee-keeper can rear a few queens for his own use, and an outline of the methods used for rearing queens on a large scale by the specialist.

4. SAN JOSE SCALE; HISTORY AND REMEDIES. (15 minutes.)

A consideration of the origin, life history of, and the remedies used in combating the San José Scale.

5. AGRICULTURAL EDUCATION FROM THE STUDENT'S POINT OF VIEW. (30 minutes.)

A plain statement of the merits and demerits of the Agricultural course and methods of instruction employed at the Pennsylvania State College, and a consideration of the practical value of such an education.

BASHORE, DR. HARVEY B., West Fairview, Cumberland County, Pa.:

1. FARM HYGIENE. (15 minutes.)

Health in the country compared with health in the cities. Principal defects are in house construction, water supply and in the methods of waste disposal. Remedies suggested. Hygiene of barnyard and cow stable discussed with reference to furnishing pure milk. Flies and mosquitoes from sanitary point of view.

2. VILLAGE HYGIENE. (15 minutes.)

Villages offer a field for sanitary improvement. The town pump discussed. A public water supply considered in conjunction with a system of sewerage.

3. GOOD HEALTH—A MUCH NEGLECTED CROP. (15 minutes.)

The proper care of our bodies quite often neglected. Human body viewed simply as a machine. Food supply, alcohol, tea, coffee and tobacco discussed. Work and rest, cleanliness, clothing and other points in personal hygiene briefly explained.

BEARDSLEE, R. L., Warrenham, Bradford County, Pa.:

1. HOW TO ESTABLISH AND MAINTAIN A DAIRY.

Selection of cows; care; feed; maintenance for success.

2. HOW TO RENOVATE AN IMPOVERISHED FARM.

Season to plow; depth to plow; economical fertilization; cultivation.

3. RAISING SKIM MILK CALVES.

Calves to replenish dairy with valuable cows. Treatment of calf.

4. SHEEP HUSBANDRY.

Selection of sheep. Time of year to purchase. Care for three months thereafter; coupling winter care and feed; spring and summer care and feed.

5. FODDER CORN, SILO AND SILAGE.

Manner of producing and using corn profitably without silo; construction of silo; harvesting and feeding silage.

6. POTATO CULTURE.

Preparation of soil. Selection of seed. Manner of planting; cultivation; treatment of bugs; harvesting and storing.

7. THE FARMER'S HORSE.

BLACK, W. C., Mercer, Mercer County, Pa.:

1. **THE VALUE OF PEDIGREE.** (30 minutes.)
2. **THE BEEF BREEDS OF CATTLE.** (30 minutes.)
3. **COMPARISON OF BEEF AND DAIRY TYPES FOR BEEF PURPOSES.** (30 minutes.)
4. **CULTIVATION AND USES OF CORN PLANT.** (30 minutes.)
5. **SHEEP: BREED, MUTTON AND WOOL.** (30 minutes.)
6. **RAISING THE CALF.** (30 minutes.)

BOND, M. S., Danville, Montour County, Pa.:

1. **TWENTY-FIVE YEARS' EXPERIENCE WITH COMMERCIAL FERTILIZERS.** (30 minutes.)
Results; formula for different crops; how to save money, buying.
2. **HISTORY, DISCOVERY AND CULTIVATION OF POTATOES.** (30 minutes.)
When, how and by whom discovered. Process of development; soil, fertilizer and cultivation
3. **GROWING AND MARKETING VEGETABLES.** (25 minutes.)
Two crops in one season.
4. **ONIONS AND CELERY.** (20 minutes.)
Without manure or lime; inexpensive.
5. **SUCCESS WITH CLOVER.** (20 minutes.)
Importance of ways by which we may succeed.
6. **RESTORATION OF EXHAUSTED SOILS AT LEAST EXPENSE.** (25 minutes.)
7. **SHORT CHAT WITH BOYS AND GIRLS ABOUT REMAINING ON A FARM.** (30 minutes.)

BRODHEAD, C. W., Montrose, Susquehanna County, Pa.:

1. **CARE OF HORSES' FEET AND TEETH, WITH SPECIMENS.** (40 minutes.)
The care from colthood to old age, and explains many mysteries that are not generally known, both interesting and instructive to both old and young.
2. **HORSESHOEING AND ANATOMY OF FOOT AND LEG.** (45 minutes.)
Giving the different methods of shoeing for the many ills that the foot and leg is heir to.

3. **SOME THINGS EVERYONE SHOULD KNOW WHO OWNS OR HANDLES A HORSE.** (30 minutes.)

4. **ZOOLOGY OF THE HORSE; A NATURE STUDY.** (Illustrated with chart and specimens) (30 minutes.)

BRUCKHART, J. W. Lititz, Lancaster County, Pa.:

1. **POULTRY ON THE FARM.** (40 minutes or less.)

How to raise the chicks. The incubators and the brooders on the farm. Poultry for eggs. Poultry for broiler and roaster. Poultry for local and for distant markets. How to prepare poultry for market. Poultry diseases. Their prevention and cure. Thoroughbred poultry on the farm.

2. **BETTER POULTRY, AND MORE OF IT.** (40 minutes or less.)
Poultry houses and yards. Improving the breeding stock. The care and the management of growing chicks. Feeding for best results. When and what to cull, and to market. Thoroughbred fowls versus mongrels. Poultry exhibitions as educators.

3. **POULTRY ON A CITY LOT.** (35 minutes or less.)
Profitable poultry in limited quarters. The necessary and the unnecessary surroundings. Sanitary conditions. Incubators and brooders. Strictly fresh poultry products.

4. **PROFITABLE MARKET GARDENING.** (40 minutes or less.)
Selecting a location. Preparing the soil. What to raise. Specialty crops. Enriching the soil. Thorough cultivation. Irrigation. Selecting seeds and plants. The art of marketing.

5. **STRAWBERRY CULTURE.** (25 to 35 minutes.)
Selecting varieties. How to secure strong plants. When to plant. Thorough cultivation. Fertilizers. Irrigation. Winter protection. Gathering the berries. Successful marketing.

BURNS, J. S., Imperial, R. D. F. No. 1, Allegheny County, Pa.:

1. **CORN.** (30 minutes.)

Breeding and selection of seed. Preparing for a cultivation of.

2. **BREEDING AND CARE OF SWINE.** (30 minutes.) (Illustrated.)

Breed and care must go together. Proper food for breeding animals and young swine. Convenient houses, feeding troughs, etc. Proper mating. What is a good specimen.

3. **SHEEP HUSBANDRY.** (25 minutes.)

Adaptability of breeds to different conditions, but is treated largely from the standpoint of producing early lambs.

4. **GROWING AND PRESERVING PORK FOR FAMILY USE.** (35 minutes.)

How to grow it in order to have meat of good quality. How to preserve it in order to retain these good qualities.

5. **THE FARMER AND HIS WIFE.** (30 minutes.) (Illustrated.)
Their duties towards each other.
6. **HOME INFLUENCE.** (40 minutes.) (Illustrated.)
Proper training of children. Mistakes of parents through indulgence, etc. Disrespect of children for parents.
7. **EDUCATION FOR COUNTRY CHILDREN.** (35 minutes.) (Illustrated.)
Must have equal advantages. Centralization is the logical solution and is sure to come. Inefficiency of some teachers, and who is at fault. Pursuing studies of an impractical nature to the neglect of those that must be used every day.

BUTZ, PROF. GEO. C., State College, Centre County, Pa.:

1. **MODERN TREATMENT OF APPLE ORCHARDS.**
A discussion of the improved methods of caring for commercial orchards; cultivation; spraying; fertilizing and pruning.
2. **PEACH CULTURE.**
A review of the cultural methods of successful orcharding. Treatment of fungous diseases and insect enemies.
3. **INSECT ENEMIES OF FARM AND GARDEN.**
A practical talk on the troublesome insects peculiar to farm crops, with remedies and treatment for their control.
4. **ORNAMENTATION OF HOME GROUNDS.**
A brief presentation of the principles of landscape gardening as applied to the farm home; the selection of vines, shrubs and trees to beautify the home.
5. **BOTANY OF THE FARM.**
This talk shows the practical value of the study of botany to the young farmer, considering the special functions of the leaves, roots and flowers of plants.
6. **AGRICULTURAL EDUCATION.**
This address is for the educational session. It points out the great value of an education to the farmer and how it is obtained by ambitious young men.
7. **SMALL FRUITS.**
A practical talk on the growing of strawberries, raspberries, currants and other small fruits.
8. **BACTERIA FOR LEGUMINOUS CROPS.**
The result of experiments in the use of nitro-culture bacteria in 1905.

CAMPBELL, J. T., Hartstown, Crawford County, Pa.:

1. **CONSTRUCTION OF POULTRY HOUSES AND FIXTURES.** (30 minutes.) (Illustrated with lantern.)
Economy, simplicity and efficiency are considered together with a system of eliminating moisture in winter. Simple devices which lighten the work of caring for fowls.

2. PROFITABLE EGG PRODUCTION. (45 minutes.) (Illustrated with lantern.)

A brief discussion of the breeding and care of hens. Factors that influence the egg. A full discussion of the theory and practice of feeding for eggs. Discusses the value of the principal feeding stuffs and their influence on the egg yield; also how to combine and feed them for best results.

3. LICE, GAPS AND POULTRY DISEASES. (20 minutes.)

A brief discourse on the theory of prevention and cure of the more common diseases of poultry, and some suggestions from experience with lice and gaps.

4. GLEANINGS FROM EXPERIENCE WITH INCUBATORS AND BROODERS. (25 minutes.) (Illustrated with lantern.)

The care and operation of machines and some things not found in books and incubator catalogues. What constitutes a successful brooder and incubator.

5. ECONOMIC METHODS OF MAINTAINING THE PRODUCTIVITY OF THE SOIL. (40 to 60 minutes.)

Formation and composition of soil manures; chemical fertilizers. The growing of legumes, drainage, etc.

6. CROP ROTATION IN RELATION TO THE IMPROVEMENT OF THE SOIL. (25 minutes.)

Economy of effort. Feeding capacity of plants. Plant food in the soil tillage; crop fallows.

7. COMMERCIAL POTATO GROWING.

Modern methods of growing potatoes by aid of machinery, with reference to diseases.

8. NITROGEN BACTERIAL INOCULATION OF THE SOIL.

What they are; how they work; inoculation by pure cultures by other means. Value of inoculation.

9. ACID SOILS AND THEIR TREATMENT. (Illustrated with lantern slides.)

Cause, prevention and treatment of acid soils.

10. THE FARMER'S GARDEN. (20 minutes.)

A talk on some ways to make the home garden more profitable without additional labor. Soil, seed, manure, tools and their use, are considered.

11. TO HAVE AND TO HOLD. (Evening lecture.) (40-50 minutes.)

A talk with, for and about country boys and girls.

CLARK, M. N., Claridge, Westmoreland County, Pa.:

1. IS THE COUNTY AGRICULTURAL SOCIETY A HELP TO THE FARMER?

To show what constitutes a good Agricultural Society; the benefits that follow.

2. BUYING AND CARE OF FARM IMPLEMENTS.

Showing the great waste in the present methods or plan of buying; then showing how to buy; also the money that can be saved in the care of our farm implements.

3. EVERY FARMER SHOULD BE A MEMBER OF THE GRANGE.

Showing upon what foundation the Grange is built; its educational features; and as it is one of the strongest organizations, it affords the best means of being a cooperative organization, and the most beneficial to the farmer.

4. THE RESULT OF EIGHT YEARS GROWING SWINE.

How I select my breeding animals; care, feeding, marketing, with results at the end of eight years; also a brief sketch of how my herd was destroyed by cholera.

5. ARE THE FARMERS' INSTITUTES HELPING THE AGRICULTURAL INTERESTS?

The farmer before the institutes were established and his condition; also, since institutes are held and his present condition.

6. THE FARM JOURNAL FOR THE FARMER.

The purity of farm journals and what they have accomplished by way of collection of actual tests along all practical lines. As an educator for the farmer.

7. THEORY AND A PRACTICAL EDUCATION.

What is theory, and what is practical education? Theoretical education is little good without its being applied by a practical man or woman—hence the necessity of practical education.

8. MARKETING THE PRODUCTS OF THE FARM.

First, by illustration, showing that so many producers are absolute failures as to marketing their crops and give the cause, and how we place our crops in the market and how we secure a market and keep it.

9. HOW I GROW HORSES.

First, as to selection of the breeding animals, and more particular as to the breed; care of colts, feeding, how to handle and break for use; the feeding of the work animal; its preparation for the market and how to have a market.

CONARD, DR. M. E., Westgrove, Pa.:

1. THE DAIRY BARN AND SURROUNDINGS.**2. CONDITIONS AND CARE NECESSARY TO THE PRODUCTION OF MARKET MILK.****3. HOW TO BUILD UP THE DAIRY HERD.****4. SOME POINTS ON THE FEEDING OF CALVES.**

COOKE, PROF. WELLS W., 1328 Twelfth Street, N. W., Washington, D. C.:

1. **ECONOMICAL FEEDING OF FARM STOCK.**
Cheap food; digestibility; relative value; balancing a ration; work of digestion; standard ration.
2. **THE VALUE OF FARM MANURE AND HOW TO RETAIN IT.**
Value depends on animal and feed. liquid, solid, leaching, heating, absorbents, land plaster, covered barnyard, spreading on hillsides.
3. **THE EFFECT OF FEED ON THE QUANTITY AND QUALITY OF MILK.**
Quality of milk, taste, smell, silage, aeration, per cent. of fat, quantity of fat, wet foods, kindness, testing.
4. **THEORY AND PRACTICE OF CROP FERTILIZATION.**
Needs of crops, fertility in soils, heavy fertilization, losses, cheap fertility, steady improvement.
5. **FEEDING FROM THE SILO THROUGHOUT THE YEAR.**
Silage cheapest food, good for summer and winter; using land and silo twice a year.
6. **FORAGE CROPS AS A SUBSTITUTE FOR PASTURE.**
Save land, increase crops, eradicate weeds, soiling directly from the field vs. indirectly through the silo.
7. **CARE AND FEEDING OF DAIRY STOCK.**
Healthfulness, cleanliness, comfort, uniformity, balancing, digestibility.
8. **HANDLING MILK AND BUTTER-MAKING.**
Shallow setting, deep setting, separator, sweet cream butter, churning, washing, salting, packing, selling.
9. **NATURE STUDY IN THE COUNTRY SCHOOL.**
Reasons for nature study, subjects taught, plant growth, insect friends and foes.
10. **ECONOMICAL FEEDING OF THE FARMERS' FAMILY.**
Economy in house and barn compared, average cost of food, cheap food, expensive living, digestibility, variety, labor question.

COX, JOHN W., New Wilmington, Lawrence County, Pa.:

1. **A FARMER'S PRACTICAL EDUCATION.**
The importance and value of an education and how the farmer can secure an education most suited to his need.
2. **COMMERCIAL FERTILIZER.**
The analysis and use of.
3. **MAINTAINING AND INCREASING THE FERTILITY OF THE SOIL.**
The elements most likely to become exhausted in the soil and how to supply them at the least expense. The importance of vegetable matter or humus in the soil.

4. MAINTAINING SOIL MOISTURE AND VEGETABLE MATTER IN THE SOIL.

The value of moisture in the soil and the best methods of conserving it.

5. THE EASIEST AND MOST PROFITABLE WAY TO GROW POTATOES.

Quality of the soil best adapted. The importance of location within reach of market. The importance of good seed and treatment. Preparation of the seed bed, planting, cultivating, digging and marketing.

6. FEEDING AND CARE OF POULTRY.

The egg production of the U. S. The necessity of careful attention. Breeds, feed, winter eggs, houses, runs, etc. The incubating and raising of chicks.

CURE, Z. T., Jermyn, Lackawanna County, Pa.:

1. PRODUCTION OF THE APPLE ORCHARD; WHY AND HOW. (20 minutes.)

Location and preparation of soil. Varieties. Pests and how to fight them.

2. AN UP-TO-DATE TALK ON CORN. (20 minutes.)

Breeding for protein contents. Corn land and its feeding. Seed selection and cultivation.

3. ECONOMY IN THE USE OF COMMERCIAL FERTILIZERS. (20 to 30 minutes.)

Supply only the plant food in which the soil is deficient. When applied to nitrogen-gathering plants, fertilizer pays from two sources. Purchase of ingredients and home mixing.

4. METHODS OF POTATO CULTURE. (20 minutes.)

Preparation for seed bed. Planting and cultivation. Spraying, when and how. Harvesting.

5. EDUCATION TO THE FARMER INDISPENSABLE. (Evening lecture.) (30 minutes.)**6. SHEEP HUSBANDRY. (20 minutes.)**

Early spring lambs. Breed. Condition. Market.

7. RAISING OF COLTS PROFITABLE TO THE GENERAL FARMER. (25 minutes.)

Class of animal. General care. Breaking in and sale.

8. THE HEIFER CALF. (20 minutes.)

Breed, feed and training.

9. SOME FUNDAMENTAL PRINCIPLES GOVERNING ANIMAL IMPROVEMENT. (25 minutes.)

DETRICH, J. D., West Chester, R. F. D. No. 12, Chester County, Pa.:

1. HOW TO KEEP TWENTY HEAD OR MORE OF DAIRY ANIMALS ON FIFTEEN ACRES.**2. EIGHTEEN YEARS EXPERIENCE IN SOILING**

3. SIXTEEN YEARS EXPERIENCE WITH WOODEN SHO.
4. SHALL WE GROW CROPS ON A FIFTEEN ACRE FARM AND NO FERTILIZER?
5. FEED, BREED AND CARE OF THE DAIRY.
6. BREEDING AND RAISING THE DAIRY ANIMAL.
7. THE AGRICULTURAL COLLEGE AND THE FARMER.
8. THE FARMER'S WASTE BASKET.
9. THE SMALL FARM vs. THE LARGE FARM.
10. BENCH, BOOK AND FARM.

DRAKE, W. M. C., Volant, Lawrence County, Pa.:

1. THE VALUE OF CLOVER AND HOW TO GROW IT. (20 minutes.)
The chief value of clover consists in its nitrogen contents. As a fertilizer, supplying the protein needed by growing animals.
2. BREEDING, FEEDING AND CARE OF FARM ANIMALS. (40 minutes.)
It never pays to breed anything but the best. It never pays to keep more stock than one can provide a proper quantity and quality of food to keep them at all times improving. All animals should have access at all times to good waer, and shelter from cold and heat.
3. THE USE OF COMMERCIAL FERTILIZERS. (30 minutes.)
The quantity, quality and manner of application must be determined by the uses, as regards the particular crop he wishes to produce.
4. POTATO CULTURE. (30 minutes.)
Manner of planting, fertilization, cultivation, etc.
5. THE CORN PLANT; ITS VALUE AND POSSIBILITIES. (30 minutes.)
As a silage plant there is nothing to compare with it. As a fat producer it has no equal.
6. THE FARMER'S EDUCATION. (30 minutes.)
The farmer's education should be supplemented with some business knowledge, some agricultural knowledge and mechanical skill.

DUVEL, PROF. J. W. T., Acting Botanist in charge of Seed Laboratory, U. S. Dept. of Agriculture, Washington, D. C.:

1. THE QUALITY OF COMMERCIAL RED CLOVER AND ALFALFA SEED. (20 minutes.)
2. GOOD SEED AND HOW TO OBTAIN IT. (30 minutes.)
3. ADULTERATED SEED. (15 minutes.)
4. SELECTING AND TESTING SEED CORN. (30 minutes.)

ELLIS, DAVID M., Bridgeport, Montgomery County, Pa.:

1. FRUIT GROWING; POSSIBILITIES IN PENNSYLVANIA. (15 minutes.)
2. SPRAYING—SIMPLIFIED FOR SAN JOSE SCALE. (15 minutes.)
3. SPRAYING; WHEN AND WHAT FOR. (15 minutes.)
4. INGENUITY ON THE FARM. (15 minutes.)
5. CARE AND USE OF FARM IMPLEMENTS. (15 minutes.)
6. WIRE FENCES; SIMPLICITY OF CONSTRUCTION. (15 minutes.)
7. FERTILITY BY HUMUS FROM THE LEGUMES. (15 minutes.)
8. WHAT I KNOW ABOUT ROADS AND ROAD MAKING. (30 minutes.)

FUNK, DR. J. H., Boyertown, Berks County, Pa.:

1. PEACH CULTURE. (30-45 minutes.)
Treating the subject from time of planting to marketing the product. Selection of soil, location and varieties.
2. THE COMMERCIAL ORCHARD AS A BUSINESS. (50 minutes.)
Comparison with other business. Some of the essentials of success. What and how to plant and care for, from beginning to profitable fruiting. Statistics showing profits from well-cared-for orchards in different states. The pleasure as well as remuneration to be derived.
3. PRUNING, FERTILIZING AND THINNING. (40-60 minutes.)
Portraying the tree from the seeding to the bearing tree in the orchard, giving plain directions as to pruning of root and top. The best methods and the reasons why. When, how and with what to fertilize. The reasons for and benefits to be derived from thinning.
4. SPRAYING HOW, WHEN AND WHAT FOR. (40-60 minutes.)
Treating of the sucking insects and fungi. The preparation of ingredients for their extermination. All the latest and best formulae. Best modern machinery for spraying in the village lot or the large commercial orchard.
5. SMALL FRUIT. (30 minutes.)
Its pleasures; its profits; varieties; methods of cultivation, etc.
6. POTATO CULTURE. (30-50 minutes.)
Soil and preparation. Best fertilizers. Methods of cutting, planting and tilling fully discussed. How to destroy insect enemies and prevent blights. Most profitable varieties, etc.

7. SAN JOSE SCALE. (40-50 minutes.)

Plain description is given the beginner that he may distinguish this insect and directions how he may successfully fight it. All the best formulæ and how to prepare them is fully treated, telling what to use while trees are dormant, as well as summer treatment. The reasons why so many fail, etc. The best machinery for the application.

8. BIRDS AND INSECTS. (45-60 minutes.)

This subject is well adapted for an evening lecture, describing all of our most valuable birds, which charm us with their bright colors and music sweet. They are brought before you in such an attractive manner as to be both instructive and entertaining to old and young, giving their habits, diet, etc., showing those that are beneficial and those that are destructive, learning your children to love, care for and protect our feathered friends.

HALL, HORACE H., Ellisburg, Potter County, Pa.:

1. STRAWBERRIES FOR THE HOME. (20-30 minutes.)

How to prepare bed. How to fertilize. Hill culture and why. Mulch and burning. Kind of plants. Early, medium, late. Quality—how to secure wild flavor. Clean culture. How to pick.

2. CEMENT FLOORS. (30-40 minutes.)

Why economic. Saves both liquid and solid manures.

3. WILL THE SILO PAY? (40 minutes.)

How to build, size, form, height. What the silage really is. Practical hints in cutting of silage. How to balance.

4. DYNAMITE. (20-30 minutes.)

Old and new way of mixing. What can you do safely? Stump work. Earth work. Rock work. How to thaw. How to keep from fumes. How to squib. Caps, their composition. Fuse, kinds. Time, per foot. How to light.

5. FARMER'S TELEPHONES. (40 minutes.)

How to organize. How to build. What equipment is necessary. Where to buy. Its cost. Practical hints as to management.

6. CLOVER FOR FEED AND FERTILIZER. (40-50 minutes.)

Seed bed. Nurse crop. Why clip? Nature of clover. How to keep permanent. Meadow mixtures. Pastures. Pasture mixtures. Value of Dutch White Alsike. When and how to cut and cure clover for hay. Clover for fertilizer.

7. OUR GREATEST BENEFACTORS. (50 minutes.) (Evening lecture.)**8. THE BASIS OF OUR LECTURES. (50 minutes. (Evening lecture.)**

HARSHBERGER, J. W., Ph. D., No. 737 Corinthian Avenue, Philadelphia, Pa.:

1. ACCUMULATION OF SOIL NITROGEN. (45 minutes.)

The nitrogen removed from the soil by crops may be restored in three ways: From the air; by nitrogenous fertilizers, and by the action of bacteria, (the life history of which is given), which live in the roots of leguminous plants.

2. THE ROLE OF LEGUMINOUS PLANTS. (45 minutes.)

Agricultural crops may be divided into two categories: Those that accumulate nitrogen, and those that consume or use up nitrogen. The second group includes the fruit producing plants, the cereals and root crops.

3. THE RUSTS OF AGRICULTURAL PLANTS AND HOW TO COMBAT THEM. (30 minutes.)

The life history of the rusts is explained in detail and the method of combating them by securing rust-proof varieties of cereals is also made a prominent feature of this lecture.

4. THE SELECTION OF CORN AND BREEDING OF INDIAN CORN. (45 minutes.)

The selection of corn can be made along several lines for fodder, for paper-pulp fibre, for the kernels and ears, etc., used as cattle food or oil manufacture.

5. POISONS AND STOCK KILLING PLANTS. (30 minutes.)

The plants injurious to stock may be divided into two classes, stock killers and poisonous plants. Stock killers are those which produce death by mechanical injury, or by obstructing the alimentary canal. Poisonous plants are those which kill animals by the presence of some noxious chemical substance in the plant.

6. THE CORN PLANT; A NATURE STUDY. (30 minutes.)

The origin of the Indian corn is considered and a discussion of its past history is given. The botanic structure of this important grass is also explained at some length, especially from the biologic and physiologic standpoint.

HERR, JOEL A., Millhall, R. F. D., Clinton County, Pa.:

1. LARGE FRUIT CULTURE. (30 minutes.)

Selection of varieties and quality of trees. Location and quality of soil. Preparation of the soil. Planting, cultivating, pruning, picking, handling and marketing fruit.

2. EDUCATION THROUGH ORGANIZATION. (20 minutes.)

The result obtained by mind coming into contact with mind, The value of discipline taught by organization. The value of united effort in one direction. The effort of study in our pursuits. The cheer and happiness which association brings.

3. CENTRALIZED SCHOOLS. (30 minutes.)

Fewer and better qualified teachers. Better, easier and more thorough instruction. Importance of gradation. More regular attendance of pupils. Fewer schoolhouses and less expense.

4. SELECTION AND CARE OF DAIRY COWS. (20 minutes.)

The purpose of selection. Points of a good dairy cow. Importance of breeding from perfect cows. Care as to health and comfort.

5. SPECIALTIES IN FARMING. (15 minutes.)

The value and possibility of labor and thought in one direction.
A study of tastes and adaptability to special employment.
The importance and value of reputation to the farmer.

6. FARM FERTILITY. (20 minutes.)

Value of fertility. Manufacture of fertilizer on the farm.
Fertility produced by cultivation. Selection and application
of commercial fertilizers. Economic distribution of fertilizers on the farm.

7. PRACTICAL ROAD MAKING. (20 minutes.)

Importance of selection of supervisors. Cash taxes. Road making implements. Characteristics of a good road. Economy of well-made roads. Repairs.

8. THE BRIGHT SIDE OF FARM LIFE. (30 minutes.)

The ability to see, appreciate and enjoy the beautiful things in nature. Optimism vs. Pessimism. The superiority of farmers compared with other labor. Modern advantages and improvements in farm houses. R. F. D. mail, telephones, graded schools, organizations, etc.

9. THE FARMER AS A CITIZEN. (30 minutes.)

HILL, W. F., Chambersburg, Franklin County, Pa.:

1. ORGANIZATION; THE PRESENT POWER. (30 minutes.)

As a world force and shows the advantages that may come to farmers through well-defined, broad organization.

2. SOIL CONDITIONS FOR GOOD CROPS. (20 minutes.)

3. SAVING AND APPLYING MANURE. (20 minutes.)

4. PERSONAL OBSERVATIONS IN OUR OWN LAND. (15 minutes.)

5. PERSONAL OBSERVATIONS IN THE LAND OF OTHERS. (15 minutes.)

6. OUR EDUCATION; OUR CAPITAL. (20 minutes.)

7. SAVING AND APPLYING MANURES. (15 minutes.)

HOOVER, HON. E. S., Lancaster, Lancaster County, Pa.:

1. FORESTRY AS PERTAINING TO FARMING. (20 minutes.)

Moisture and rainfall. Value of trees. Forests prevent washing away the ground. What trees to plant.

2. EDUCATION OF THE FARMER'S SON. (15 minutes.)

A practical education that will fit him for all purposes. Make the farm attractive. Give him an interest in the farm. Teach him how to make money and how to take care of it. Show him the importance of his business.

3. FAILURES IN FARMING AND THE CAUSES. (15 minutes.)

Depression in value of farms and of farm products. Want of system on the farm. Inferior breeds of cattle. Poor soil and poor seeds. Want of knowledge of farming.

4. SYSTEM ON THE FARM. (15 minutes.)

A place for everything and everything in its place. A program mapped out.

5. BEAUTIFYING THE HOME GROUNDS. (15 minutes.)

Build on high ground. Ground plan sloping from all sides. Face east or south. Plant trees and shrubbery. Driveways and walks. Flower beds and truck garden.

6. SOIL IMPROVEMENTS. (15 minutes.)

Use barnyard manure, lime, commercial fertilizers. Thorough cultivation.

7. CULTIVATION OF TOBACCO; ITS CURING AND PREPARATION FOR THE MARKET. (20 minutes.)

Preparing seed bed. Raising plants. Growing in the field. Its curing and preparation for the market.

8. THE PROPER TIME FOR HARVESTING FARM CROPS. (15 minutes.)

Best time for clover and timothy hay. Harvesting the wheat crop. Oats crop well-matured and left in the field until properly dried. Corn crop, do not cut too green. Potatoes, take out of ground dry if possible.

9. FARM MACHINERY. (20 minutes.)

Keep in shelter. Keep well oiled. Have an implement house. Keep in good repair. Paint occasionally.

10. THE HORSE; HIS BREEDING, REARING AND TRAINING. (20 minutes.)

Select good stock. Breed for the purpose you want. Feed colts liberally to keep growing. Keep them out in the open air on clear days. Training, begin young. Treat them kindly and have patience in teaching the colt. Get his confidence.

11. GROWING TREES ON THE FARM. (15 minutes.)

Their value in a number of ways. Have a good orchard. Shade trees around the buildings. Grow trees for fencing purposes. Plant along streams. Plant about springs.

12. FARMER'S INSTITUTES; THEIR BENEFIT. (15 minutes.)

Educates the farmer to higher farming. Brings about more spirit in the calling. The farmer's social condition is better. Learns by the experience of his fellow-farmers.

HULL, GEO. E., Transfer, R. D. F., Mercer County, Pa.:

1. HIGH GRADE FARM BUTTER. (25-30 minutes.)

Competition with oleomargarine. Care of the milk. Methods of creaming. Proper ripening of cream. Churning. Printing or packing for market. How to find a good market.

2. CONSTRUCTING AND FILLING OF SILOS. (20 minutes.)

Who needs a silo. Locating a silo for convenient feeding. Materials for building. Different methods of building. When and how to fill.

3. CONSTRUCTION OF A LABOR-SAVING BARN. (20 minutes.)

Utilizing in handling feed stuffs. Handling and saving the liquids and solids in manure. Modern mangers. Storing silage.

4. MARKETING FARM PRODUCTS. (25 minutes.)

One rule for successful sales. Farms near and distant from market, advantages and disadvantages. How to seek and bring satisfactory buyers. Some common mistakes in marketing farm products.

5. THE FARM WATER SUPPLY. (20 minutes.)

Pure water the farm's first requisite. Ills and losses from impure water. Some modern means of obtaining pure water. Purifying well water. Something about springs, driven and drilled wells.

6. FEEDING STEERS FOR MARKET. (15 minutes.)

Four points to observe in the commencement. Points in buying and selling. Stabbling. How to feed. Increasing market for baby beef. How and when to sell.

7. SOME EXPERIENCES WITH SHEEP. (15-20 minutes.)

Selecting and feeding sheep for market. Raising early lambs. Some side lines in this specialty. Putting wool into shape for market.

8. OUR FARM HOMES. (25-30 minutes.)

Some points to the credit of the farm home. Sanitation. Locating a farm home.

KAHLER, HON. A. J., Hughesville, Lycoming County, Pa.:

1. SOIL FERTILITY.

Treating of how to obtain it and maintain it.

2. CORN CULTURE.

Remarks on importance of plant. Best modes of cultivating it.

3. TAXATION.

Showing the inequality of our system and unfair effects upon real estate.

4. HOGS FOR PROFIT.

Treating on breeding, feeding, marketing.

5. CONCENTRATION OF SCHOOLS IN RURAL DISTRICTS.

6. MY EXPERIENCE WITH LIME AND COMMERCIAL FERTILIZER.

Why we lime and for what purpose.

7. PROPER CARE OF BARNYARD MANURE.

Treating on how to preserve all the fertility it contains.

8. HOW BEST TO KEEP THE BOYS ON THE FARM.

KESTER, R. P., Grampian, R. F. D. No. 2, Clearfield County, Pa.:

1. POULTRY CULTURE. (30 minutes.)
Breed for farmers. Houses and yards. Natural and artificial incubation. Feeding young chicks for broilers and for layers. Selection of breeders. When and how to market.
2. GARDENING FOR HOME AND FOR MARKET. (30 minutes.)
Preparation of soil. Raising plants. Hot-beds. Cold frames. Thinning. Transplanting. Drilling. Culture. Watering. Pests. Special directions for several vegetables. Marketing.
3. SMALL FRUIT CULTURE. (30 minutes.)
Location. Soil. Preparation of the soil. Fertilizing. Plants and planting. Cultivation. Pruning and thinning. Packing, and marketing.
4. COMMERCIAL FERTILIZERS. (30 minutes.)
Profitable use. How to know what is needed. Easy experiments. Sources of elements. Agricultural vs. Commercial value. How to calculate commercial value.
5. NATURAL IMPROVEMENT OF THE SOIL AND ITS PRODUCTS. (30 minutes.)
Original soil. Its depletion. Nature's method of making soil. Conditions required by plant roots. Draining. Plowing. Cultivation. Cover Crops. Leguminous crops. Rotation.
6. THE RURAL SCHOOLS. (45 minutes.) (Illustrated lecture.)
Their needs and how to meet them.
7. RURAL LIFE. (45 minutes.) (Illustrated lecture.)
Its advantages and possibilities, with a view to encourage the young men and women to stay on the farm.

LEDY, J. H., Marion, Franklin County, Pa.:

1. GENERAL FRUIT GROWING; HOW TO TAKE CARE OF TREES.
2. PEACH, APPLE AND PLUM CULTURE.
3. PRUNING, CULTIVATING AND FERTILIZING THE ORCHARD.
4. THE FARMER'S GARDEN.
5. ALFALFA; ITS VALUE AND HOW TO GROW IT.
6. SMALL FRUIT CULTURE.
7. TOMATOES AND CANTALOUPS; HOW TO GROW THEM.
8. POULTRY FOR PROFIT, AND HOW TO MAKE HENS LAY IN JANUARY.
9. SAN JOSE SCALE; HOW TO DETECT IT AND HOW TO EXTERMINATE IT.
10. CRIMSON CLOVER AND SOJA BEANS; THEIR VALUE AND HOW TO GROW THEM

LEHMAN, AMOS B., Fayetteville, Franklin County, Pa.:

1. THEORY AND PRACTICE IN FARMING.

A contrast of past and present methods in preparation of soil for different crops.

2. BREEDING, FEEDING AND PROFIT IN HOGS.

History and evolution of the animal. Economical methods of feeding.

3. GROWING AND MARKETING POTATOES.

Botanical history of plant and conditions necessary for success, i. e., method of planting, cultivating, fertilizing, disease and insect remedies.

4. NATURE STUDY IN THE PUBLIC SCHOOLS.

Influence upon the farmer's life and success.

5. BEEF vs. DAIRY CATTLE.

Cost of feeds and results on other farm crops from fertilizer produced. Breed, conformation, method and care in feeding.

6. GARDENING FOR PROFIT.

Special crops that can be marketed to an advantage. Selection of seed. Time of planting.

LESH, N. M., Sciota, Monroe County, Pa.:

1. HOW TO FEED THE HORSE. (40 minutes.) (Illustrated.)

Anatomical arrangement of digestive organs. Order of feeding different materials. Watering. Process of digestion. Frequency of giving food. Changes of diet. Kind of food. Quality of the food. Mouldy or musty food must not be given.

2. SOME POINTS ON ANATOMY OF HORSE FOR BREEDING AND GENERAL PURPOSE. (30-40 minutes.)

The head, neck, withers, spinal column, front shoulders, hind quarters, legs, feet.

3. THE DOG vs. THE DAIRY COW. (30-40 minutes.)

The dog should not be used for driving; should be kept out of sight of the cow during time of calving; during period of lactation; during her whole period of profit.

4. THE CENTRALIZATION OF TOWNSHIP SCHOOLS. (30-40 minutes.)

Conditions that make it desirable. Advantages of graded schools over mixed schools.

5. THE FARMER'S HOME. (30-40 minutes.)

Location. Beautify the surroundings. Inside improvements. Peace and plenty.

6. HOW TO GET THE BOYS IN LOVE WITH THE FARM. (20 minutes.)

7. AGRICULTURE AND NATURE STUDY IN THE SCHOOLS. (30-40 minutes.) (Evening lecture.)

8. THE PREHISTORIC RACES; WHO WERE THEY ANY-HOW?

LIGHTY, L. W., East Berlin, Adams County, Pa.:

1. THE FARMER'S COW; HOW TO MAKE HER PROFIT-ABLE. (50 minutes.)
Basic and fundamental lesson.
2. FEEDING THE DAIRY COW. (45 minutes.)
3. CULTURE AND FEEDING OF THE CORN CROP. (45 minutes.)
4. SILO EXPERIENCE AND PRACTICE. (30 minutes.)
5. SOILING AND SOILING CROPS. (30 minutes.)
Nos. 3-4-5 are simply detached parts of lesson No. 2, with some practical hints on growing some of the best feeds on farm.
6. VALUE, CARE AND APPLICATION OF FARM MANURE. (30 minutes.)
Lesson of practical care and management of this much neglected, but very valuable by-product of the dairy barn.
7. PRODUCING AND MARKETING DAIRY PRODUCTS. (40 minutes.)
Is an attempt to set forth a few of the factors that tend to success at the market and dollar end of the business.
8. THE MAKING OF A HOME ON THE FARM. (30 minutes.)
Is a simple, unadorned story of the speaker's experience.
9. EDUCATION FOR OUR BOYS AND GIRLS; WHAT AND HOW. (45 minutes.)
A plea for better educational facilities for our (the farmer's) children.
10. A PAIL OF MILK. (15 minutes.)
A little nature study only for the school children when they visit our institutes.

MENGES, PROF. FRANKLIN, York, York County, Pa.:

1. DOMESTIC CHEMISTRY. (30 minutes.)
Changes that take place. The best ways for looking these substances.
2. FIXATION OF FREE NITROGEN EXPLAINED. (30 minutes.)
What is meant by fixation. How the farmer may know whether this fixation is going on through the agency of his leguminous crops.
3. NITRIFICATION; CONDITIONS NECESSARY TO PRODUCE IT. (30 minutes.)
Nitrification defined. How to obtain the conditions necessary to produce it.

4. **MAINTENANCE OF SOIL MOISTURE.** (30 minutes.)
Average rainfall annually. How water is lost. How to prevent this loss. Why so much water is needed.
5. **METHOD FOR RAISING HAY AND LEGUMINOUS PLANTS.** (40 minutes.)
The farmer, the stockraiser, increasing the hay crop. How to introduce leguminous crops.
6. **BENEFITS OF CORN BREEDING.** (40 minutes.)
Adaptation of corn to climate and soil. Variety, stalk, ear, kernel. How to increase quantity and quality. How to determine this improvement without chemical analysis.
7. **VARIOUS METHODS FOR CROP ROTATION.** (40 minutes.)
For the grain, dairy and hay. Rotations into which leguminous crops are introduced.
8. **THE NECESSITY OF EDUCATION FOR THE FARMER.** (30 minutes.)
When should this education begin. What should it be. Where should it be given. Who should give it.
9. **VALUE OF OUR NATIVE BIRDS IN AGRICULTURE.** (30 minutes.)
An illustration of the foods birds feed on. How and why birds are destroyed and the result of this destruction.
10. **INSECT FRIENDS AND FOES OF THE FARMER.** (30 minutes.)
Benefits of insects. The injuries by insects.

McDOWELL, PROF. M. S., State College, Centre County, Pa.:

1. **COMMERCIAL FERTILIZERS.**
General nature; elements needed; economical purchase of nitrogen, phosphoric acid and potash; their sources, forms and uses.
2. **LIME AND ITS ACTION.**
Forms of lime, conditions it effects, forms to use, place of applying.
3. **SOIL MOISTURE.**
Necessity to plants. Sources and forms of. Preserving in the soil. Relation to soil temperature.
4. **BARNYARD MANURE.**
Composition. Loss from leaching and fermentation. Conditions effecting such loss.
5. **A FEW FACTS ABOUT BACTERIA.**
6. **AGRICULTURE, AN ART**

NORTHUP, HENRY W., Dalton, R. F. D., Lackawanna County, Pa.:
(15-30 minutes each.)

1. **SELECTING, CARE AND MANAGEMENT OF THE DAIRY.**
Methods of choice. Producing or buying. Milk purposes or butter. Care. Comfortable quarters. Good ventilation. Proper food. Summer and winter management, etc.

2. **PRACTICAL EXPERIENCE WITH THE SILO.**
Its location. The kind you need. Filling. Material. How to produce and when to fill. Saving expense. How to feed. How to keep. Profits derived. Health of animals fed, etc.

3. **POTATO GROWING.**
Choice of ground. Fertilizing the soil. Preparing the ground. Selecting the seed. Preparing the seed. When to plant. How to cultivate. When to spray. When to dig, etc.

4. **THE EXHAUSTION AND RESTORATION OF OUR SOIL.**
Why it does not produce. How to restore. Cheap fertility. Conserve soil moisture. Make available the elements of fertility. Use the legumes.

5. **FRUIT CULTURE.**
Selection of place and varieties. Selection of trees. How to set. How to cultivate. How and when to prune. How to bud. How to force the growth. How to spray.

6. **FARM PRODUCTS AND HOW TO MARKET THEM.**
Produce the best grade. Place in fine receptacles. Attractive. Suitable attire. Genial. Polite. Proper team and conveyance. Where to sell. When to sell. When to hold.

7. **NATURE STUDY IN COUNTRY SCHOOLS.**
It's nothing new. The human face. Trees and plants. Insects and their life and habits. Birds and their peculiarities.

8. **EDUCATING THE FARMER.**
The farmer's business needs it. He is modest and bashful. He is called to official duties. He is able-bodied and worth educating.

9. **DESIRABLE COUNTRY HOMES AND HOW TO ENJOY THEM.**
We have the best place for them. We want all the conveniences. We want literature and music. We can have beautiful surroundings. We can have comforts of life.

ORR, T. E., Beaver, Beaver County, Pa.:

1. **POULTRY FOR FARMERS.** (30 minutes.)
The place of the hen on the farm, compared with other farm animals.

2. **THE CITY EGG TRADE; HOW TO GET IT.** (30 minutes.)
A large and constant trade. A fastidious trade. A good paying trade. Uniformity and quality demanded.

3. **ECONOMICAL POULTRY HOMES.** (Illustrated). (30 minutes.)
Low cost. Durability at least 12 years. Low down and air tight at the back. Light and ventilation. Floors and litter.

4. INCUBATORS AND BROODERS. (30 minutes.)
You must buy the incubator; you may build the brooder. How to do both.
5. FEEDING FOR EGGS AND MEAT. (30 minutes.)
The chemical demands identical. Variety the first essential. Feeding the supply the natural demand. Feeding the grain. Artificial results.
6. YOUTH AND OLD AGE ON THE FARM. (40 minutes.)
Given in the hope that the aged may remember, and the young anticipate.
7. WHAT IS A GOOD HIGHWAY? (Illustrated.) (30 minutes.)
A smooth, solid stone road. How to build; how to maintain. The famous Missouri dirt road. The implement that makes it.
8. THE FARMER AND THE PUBLIC SCHOOL. (30 minutes.)
He pays for much he does not get. How he may get something valuable in return for his money.
9. THE BUSINESS END OF FARMING. (30 minutes.)
The farmer compared with the merchant, the banker and the manufacturer.

ORR, MRS. T. E., Beaver County, Pa.:

1. DOMESTIC SCIENCE IN FARMERS' HOMES.
What shall we eat? How shall we cook?
2. CHILD STUDY.
What shall we teach our children? How shall we teach them?
Who shall teach them?
3. EDUCATION IN THE RURAL HOMES.
The farmer's wife. The farmer's school system.

OWENS, PROF. WM. G., Lewisburg, Union County, Pa.:

1. WHAT CHEMISTRY IS DOING FOR THE FARM. (60 minutes.)
In the fields. At the barn. At the house. Chemistry ascertains the desirable parts of plants for feeding. Chemistry finds new markets for farmer's products.
2. EDUCATION AND THE FARM. (60 minutes.)
The best talent comes from farms. Farmer does greater variety of work than mechanic. No branch of learning that he cannot apply in his business.
3. SANITATION ON THE FARM. (30 minutes.)
Importance. Prevention vs. Cure. Fresh air and sunshine or medicine?
4. IMPROVEMENT BY BREEDING. (30 minutes.)
Do plants improve as well as animals? What has been done?
How has it been done?

5. **FORMATION AND IMPROVEMENT OF SOILS.** (30 minutes.)
How were the soils formed? What are farmers doing to improve the farm?
6. **WEEDS.** (30 minutes.)
What are they? Why they flourish. Their use. Some methods of destroying them.
7. **USE OF MANURE.** (30 minutes.)
Kinds of manure. How they act. The effect on each part.
How to get the best result from manure.
8. **BACTERIA AS A SOURCE OF NITROGEN.** (30 minutes.)
How bacteria grows. How they fix nitrogen. When can they help the farmer. How obtained and applied.

PEACHEY, J. H., Belleville, Mifflin County, Pa.: (25-40 minutes each.)

1. **CORN BREEDING.**
Manner of operating. Selection of seed. Testing, care, planting, cultivation, detasseling.
2. **CORN CULTURE.**
Manuring, fertilizing, plowing, when and how. Harrowing, planting, cultivating and harvesting.
3. **BUTTER-MAKING ON THE FARM.**
Care of cream, churning, salting the butter, working and marketing.
4. **ECHOES FROM THE FARM.** (Illustrated lecture.)
Entertainment and instructions from farm notes.
5. **SOIL IMPROVEMENT.**
Rotation of crops, lime, stable manure, green manuring and cultivation.
6. **BREEDING AND FEEDING THE PIG.**
Purpose in view. Selection of breed, type, feed, variety, quantity, quality of product and marketing.
7. **THE PROBLEM OF EDUCATION FOR COUNTRY CHILDREN.**
A plea for better educational advantages,
8. **THE CLOVER CROP AND HOW TO GROW IT.**
Value as feed and fertilizers, and experience in growing the crop.
9. **THE VALUE OF THOROUGH CULTIVATION.**
Experience and observation in the cultivation of the soil.
10. **THE HOME ON THE FARM.**

PHILIPS, HON. THOMAS J., Atglen, Chester County, Pa.:

1. **INTELLIGENT FEEDING OF DAIRY STOCK.** (25 minutes.)
Some hints as to how I made a dairy pay a good profit.
2. **PROFIT OR LOSS IN THE DAIRY.** (30 minutes.)
Some of the mistakes I made that I would have you avoid.

3. **COMMERCIAL FERTILIZERS; THEIR NATURE AND USE.**
(40 minutes.)

What they are made of. The function of each ingredient. How to buy cheaply.

4. **LIME, DO YOU NEED SOME?** (25 minutes.)

Its nature. Its use to the farmer; also its injurious effects.

5. **THE SILO, AN ECONOMIC.** (30 minutes.)

How it helped me to make a milk dairy profitable.

6. **RENEWED FERTILITY; HOW TO GET IT.** (20 minutes.)

An explanation of soil-making. Some experiences with clover.

7. **THE CHICKEN, A SOURCE OF PROFIT.** (20 minutes.)

Some experience with feeding and raising chickens on the farm.

8. **OUR INSECT FRIENDS.** (Illustrated lecture.) (30 minutes.)

Some of the common insects that assist us as farmers.

9. **THE WIFE'S SHARE.** (Illustrated lecture.) (50 minutes.)

A talk to the farmer in the interest of the home.

SAMPSON, PROF. H. O., Waterford, Erie County, Pa.:

1. **AGRICULTURE IN OUR PUBLIC SCHOOLS.** (20-30 minutes each.)

Where agriculture is now taught. Where same may be introduced to advantage. How the subject may be treated. Why the public schools should have such courses.

2. **HIGH SCHOOL COURSES IN AGRICULTURE.**

Where such courses have been established. Their success. More such courses to be adopted. What educators think of this work. How we are conducting the work in the Waterford High School.

3. **EXPERIENCES AS A HIGH SCHOOL INSTRUCTOR IN AGRICULTURE.**

Difficulties in starting work. How we have succeeded at Waterford.

4. **WHY AGRICULTURE SHOULD BE TAUGHT IN OUR PUBLIC SCHOOLS.**

To reach boys that cannot go to an agricultural college. To act as feeders for the agricultural college. To interest boys in lines of successful agriculture.

5. **SOME SOIL PROPERTIES AND THEIR RELATION TO CROP PRODUCTION.**

How soil is formed. Its composition. Effects of water, tillage, fertilizers, etc.

6. **SOIL FORMATION.**

A discussion of natural forces forming the soil, including weathering, disintegration, transportation, deposition and composition.

7. CROP ROTATION.

How plants feed. Fertility removed by various crops. How excessive loss of fertility may be prevented.

SCHOCK, OLIVER D., Assistant to Dairy and Food Commissioner, Harrisburg, Pa.:

1. ENFORCING THE PURE FOOD LAWS OF PENNSYLVANIA.
2. EDUCATION FOR THE FARMERS' SONS AND DAUGHTERS.
3. FLORICULTURE IN COUNTRY HOMES.
4. PROGRESS IN AGRICULTURE.
5. PROFITABLE POULTRY ON THE FARM.
6. GROWING GRAPES FOR PLEASURE AND PROFIT.
7. THE COUNTRY FAIR.

SCHWARZ, HON. R. F., Analomink, Montgomery County, Pa.:

1. MARKET GARDENING. (45 minutes.)
A statement of requirements in man, animals, tools and conditions for successful business.
2. SMALL FRUIT GROWING. (30 minutes.)
A talk on planting, growing and harvesting of fruit which can be shortened or lengthened according to requirements of section of State.
3. THE COMMERCIAL ORCHARD. (35 minutes.)
Showing preparation of soil, fertilization, cultivation and selection of young trees.
4. THE ORCHARD FOR HOME CONSUMPTION. (30 minutes.)
Same as commercial orchard talk, except as applied to varieties suitable for home or nearby market.
5. A THOROUGH UNDERSTANDING OF THE FERTILIZER QUESTION. (45 minutes.)
A plain talk to farmers, showing the real value of any analysis submitted and giving notice as to how to save money in fertilizing.
6. THE HOME MIXING OF FERTILIZER. (30 minutes.)
Showing plainly how farmers can save money by home mixing giving consideration to the various ingredients and their values.
7. RECLAIMING OF WORN-OUT SOIL WITHOUT MANURE, OR SUCCESS WITH CRIMSON CLOVER. (60 minutes.)
This is a plain and unvarnished story of improving a worthless farm without a pound of manure and merely ordinary application of fertilizers.
8. PROFIT IN POULTRY. (40 minutes.)
Showing breeding, housing and feeding of fowls for egg production.

9. THE NEW ROAD LAW AND THE FARMER'S DUTY UNDER IT. (30 minutes.)

A talk showing road improvement in different counties and pointing out the duty of farmers while the State is building the few miles of road it can in any county under present law.

10. WHY SHOULD A FARMER BOY AND GIRL BE EDUCATED? (45 minutes.) (Illustrated lecture.)

Advantages of education.

11. FRUITS AND VEGETABLES FOR THE FARMER'S TABLE. (40 minutes.) (Illustrated lecture.)

Teaches how to grow and care for home garden and small fruits.

SEEDS, R. S., Birmingham, Huntingdon County, Pa.:

1. VALUE OF BARNYARD MANURE. (30 minutes.)

When, where and how to apply it.

2. SOIL IMPROVEMENT, THE KEYNOTE OF AGRICULTURE. (30 minutes.)

3. THE VALUE OF FERTILITY AND CHEAPEST WAY TO GET IT. (40 minutes.)

4. EDUCATION AND THE FARMER. (20 minutes.)

Directed to the man on the farm whose school days are over.

5. BENEFITS DERIVED FROM FARMERS' INSTITUTES. (20 minutes.)

Showing how the farmer began to think, read and advance on account of the institutes.

6. WHAT CONSTITUTES A COUNTRY HOME. (45 minutes.)

7. MISTAKES IN LIFE EXPOSED. (60 minutes.)

Sunshine, and hunting the bright side.

STOUT, W. H., Pinegrove, Schuylkill County, Pa.:

1. FRUIT GROWING.

2. EXPERIENCE IN DRAINING CLAY BOTTOM LAND.

3. THEORY vs. PRACTICE.

4. COMMERCIAL FERTILIZERS AND COMPOUNDS.

5. WASTING MANURE.

6. GEOLOGICAL OBSERVATIONS. (30 minutes each.)

STUART, R. R., Callensburg, Clarion County, Pa.:

1. SWINE RAISING. (30-40 minutes.)

Kinds of breeds. Age to begin to breed. Breeding pens. Care of pigs. Feed.

2. DAIRY BACTERIA. (30 minutes.)

History of bacteria. Care of milk, pails and strainers. Preparation of cow. Contamination of milk. Number of bacteria in milk. Kinds of bacteria in milk. How to keep milk cool and fresh.

3. CENTRALIZATION OF TOWNSHIP SCHOOLS. (40 minutes.)

What the schools are doing. Disadvantages of disconnected work. Difficulties in getting to school. Expense of so many separate school buildings.

4. FRUIT CULTURE. (40 minutes.)

Planting trees. Cultivation. Time to trim. Protection.

5. STABLE MANURE. (40 minutes.)

Value. Mechanical conditions of soil. Source of fertilizing value. Caring for manure. Time to haul out.

6. SHEEP HUSBANDRY. (40 minutes.)

Care. Different breeds. Summer management. Care in handling. Season for lambing. Sheep washing. Shearing. Winter management.

7. IDEAL YOUTH; THE EDUCATION OF THE FARMER BOY. (60 minutes.) (Evening lecture.)

SURFACE, PROF. H. A., Economic Zoologist, Harrisburg, Pa.:

1. THE ECONOMIC VALUE AND PROTECTION OF OUR NATIVE BIRDS. (40-50 minutes.)

2. GENERAL PRINCIPLES AND METHODS OF INSECT WARFARE. (40 minutes.)

3. THE HESSIAN FLY IN PENNSYLVANIA. (30 minutes.)

4. OUR INSECT FRIENDS. (Illustrated.) (30-40 minutes.)

5. NATURE STUDY AND AGRICULTURE IN THE PUBLIC SCHOOLS. (25-30 minutes.)

6. THE CENTRALIZATION OF SCHOOLS. (20 minutes.)

7. HIGHER EDUCATION FOR FARMERS' BOYS AND GIRLS. (20-25 minutes.)

8. THE ELEMENTS OF SUCCESS. (15-20 minutes.)

9. THE NEEDS OF THE FARMER. (30-40 minutes.)

THAYER, DR. I. A., New Castle, Lawrence County, Pa.:

1. TILE DRAINING; WHY AND HOW. (40 minutes.)

2. SOIL MOISTURE. (30 minutes.)

Amount used by different plants. Its movement in soil and soil plants. How to secure and retain it.

3. PREPARATION OF THE SEED BED. (40 minutes.)

Methods. Plowing; how and when. Kind of plow. Harrowing and rolling. How to lessen hillside washing.

4. STABLE MANURE. (40 minutes.) (Illustrated.)

Its fertilizing constituents and their value. Its value as humus. The changes and losses it undergoes and sustains. How to prevent losses. How to apply.

5. COMMERCIAL FERTILIZERS. (30 minutes.)

Different elements; their source and functions. Special needs of different soils and crops. Home mixing. How to calculate their cash value from analysis. How to apply.

6. **CLOVER AS FEED, AND HOW TO CURE.** (30 minutes.)
Its feeding value for different purposes, muscle, milk, eggs, wool. How to cut and cure.
7. **ALFALFA.** (40 minutes.)
Its high value. Experiment Station reports. How to produce it.
8. **THE CLOVERS AS FERTILIZERS.** (40 minutes.)
The great problem of restoring fertility. Wealth of Pennsylvania soils in the mineral elements of fertility. How clover makes them available. How to produce them. Some new and well-tried methods.
9. **STOCK FEEDING.** (30 minutes.)
What is a balance ration? No cast-iron rules. Different things to be kept in view. Product to be produced. Health of the animal. Cost of feed. By-product of the stable.
10. **STRAWBERRY CULTURE.** (30 minutes.)
Value. The soil and its preparation. Plants and how to obtain them. Setting, cultivation, mulching, burning and subsequent cultivation of varieties.
11. **HOME HYGIENE.** (Evening lecture.) (30 minutes.)
The vital center. Observations in medical practice. Economical and efficient heating and ventilating. The water supply of the country home.
12. **IMPORTANCE OF NATURE STUDIES IN OUR PUBLIC SCHOOLS.** (Evening lecture.) (40 minutes.)
The errors of ascetism. Art vs. Nature. Elevation of childhood. Needed reform in the school. How accomplished.

TOWER, DR. E. E., Hop Bottom, Susquehanna County, Pa.:

1. **INFECTIOUS DISEASES OF FARM ANIMALS.** (30 minutes.)
Anthrax. How herds become infected. How disease is carried to other herds. Duration of disease. Danger to man by handling or skinning animals that have died with the disease.
2. **TUBERCULOSIS.** (30 minutes.)
Cause. Symptoms. How transmitted from animal to animal and from herd to herd. How to know this from other diseases. Danger of infection. Tuberculin test. How used.
3. **RABIES.** (30 minutes.)
History. Distribution. Animals affected. Cause of the disease. Method of invasion. Danger from bites. Period of incubation. Erroneous ideas concerning rabies.
4. **GLANDERS.** (30 minutes.)
History. Distribution. Cause. Symptoms. Duration of disease. Farcy and glanders are one and the same, only in a different form. Every owner of a horse should know something of the disease. How transmitted.
5. **THE HORSE IN DISEASE AND HEALTH.** (40 minutes.)
The normal condition. Sanitary condition of stables. Pure air and light govern the health, condition and value of the horse. Feed and water at the proper time.

6. **COMMON DISEASES OF FARM ANIMALS.** (30-40 minutes.)
Diseases frequently start from a slight cause and oftentimes made worse by bad treatment. Discussion of some diseases, such as colic, distemper, indigestion, founder, heaves, etc.

7. **THE HORSE.** (60 minutes.) (Evening lecture, illustrated with lantern.)

Collection of famous horses. Different types. Conformation, good and bad. Artist's model. Blemishes, etc.

WAGNER, F. J., Harrison City, Westmoreland Co., Pa.:

1. **SOILS AND SOIL MAKING.** (15-20 minutes.)
Formation of soils. Applying commercial fertilizer. Manurial crops. Keeping stock. Fertilizing value of leading feeding stuffs. Importance of humus in soils. Use of lime.
2. **THE BUSINESS SIDE OF FARMING.** (15-20 minutes.)
Why some industrious farmers fail financially. Necessity of a good system of accounts. The farmer's relation to middlemen. Keep posted on the principles of commercial law.
3. **DAIRYING FOR PROFIT.** (15-20 minutes.)
A good dairy cow. Proper feeding and care.
4. **CLOVER AND ITS CULTIVATION.** (15-20 minutes.)
Importance of clover on Pennsylvania farms. Description of leading varieties. Essentials of successful culture. Time to cut for hay. Its feeding value compared with grasses.
5. **EDUCATION FOR THE FARMER AND HIS FAMILY.** (15-20 minutes.)
6. **ADVANTAGES IN CREAM SEPARATOR.** (15 minutes.)
The gravity system. Centrifugal system. Higher quality of products from separator.

WALLACE, MRS. MARY A., Ellwood City, Lawrence County, Pa.:

1. **DOMESTIC SCIENCE.** (40 minutes.)
2. **CONSOLIDATION OF RURAL SCHOOLS.** (40 minutes.)
3. **THE COUNTRY HOME; ITS SANITATION, CONVENIENCE, ETC.** (30 minutes.)
4. **TEACHING HOUSEHOLD ARTS IN SCHOOL.** (40 minutes.)
5. **A TALK WITH COUNTRY BOYS AND GIRLS.** (40 minutes.)
6. **FOOD AND NUTRITION OF MAN.** (40 minutes.)

WATTS, D. H., Kerrmoor, Clearfield Co., Pa.:

1. **THE DAIRY HERD AND STABLE.** (30 minutes.)
Herd quality, dependent upon individual merit. Development, selection, pedigree and performance. The value of past record. The stable. How to construct and keep it.
2. **FEED AND CARE OF THE DAIRY HERD.** (30 minutes.)
The selection of feed. Quantity and quality of the feed and its relation to production and profit. The management of dairy animals. Individual development.

3. THE SILO AND WHY PROFITABLE. (30 minutes.)

Its importance in modern agriculture. How to build, size, convenience, durability. Ensilage in milk and beef production. A comparison of old and new methods.

4. GILT EDGE BUTTER; HOW TO MAKE IT AND SELL IT. (30 minutes.)

The first requisite, clean, wholesome milk from a well-kept herd of cows. Dairy room work. Creaming. Packing. Shipping. Pleasing the consumer, etc.

5. THE STEAM ENGINE AND ITS USE ON OUR FARM. (20 minutes.)

How we use the engine and boiler the year round. The importance of each farm being equipped with a suitable power. A comparison of powers in use on a farms.

6. FARM BUILDINGS AND BLUNDERS. (30 minutes.)

The importance of great care in locating and erecting farm buildings. Convenience, comfort, contentment, health and beauty hinge on well-developed and properly executed plans. Some common mistakes. Home environments.

7. THE APPLE ORCHARD AND ITS CARE. (30 minutes.)

Commercial orcharding. Home supply. Selection of varieties. The young tree; how, when and where to plant it. Fertilizing, pruning and thinning out fruit. Insect pests.

8. GATHERING AND MARKETING FRUITS. (30 minutes.)

Systematic and careful handling of fruits. Grading and packing. Business principles applied. The farmer caterer to the consumer.

9. A PRACTICAL EDUCATION FOR THE FARMER. (30 minutes.)

Modern farming. The business and social side of rural life. What education is essential. Educational agencies of the day. Some thoughts about our rural schools.

WATTS, PROF. R. L., Scalp Level, Cambria County, Pa.: (30 minutes each.)

1. PRACTICAL PLANT FEEDING.

The food requirements of plants; chemical composition of soils; function of various plant foods; the superior value of barnyard manure in plant feeding; home mixing of fertilizers; plant feeding for profit.

2. SOIL BACTERIA.

Nature and work of soil micro-organisms; favorable and unfavorable conditions of soil bacteria; the relation of humus to soil bacteria.

3. SOIL MOISTURE PROBLEMS.

Importance of water in crop production; how water is lost; the water-holding power of various soils; the control of soil moisture; humus the great need of soils.

4. THE FARM MARKET GARDEN.

This lecture relates to the culture of a few vegetables which may be grown profitably by general farmers.

5. MANAGEMENT OF ORCHARDS.

Starting the young orchard; cultivation; pruning; fertilizing; spraying.

6. SMALL FRUIT CULTURE.

Practical instruction on the cultivation of strawberries, raspberries and blackberries.

7. THE FARM AS A FACTORY.

This lecture relates to farming as a manufacturing business. The labor question, policy and management, and character of products manufactured, etc., are considered.

8. THE FARM'S BEST PRODUCT. (Evening lecture.)

For the home session, devoted to the interest of our boys and girls.

9. AGRICULTURAL EDUCATION.

The need, demand, value; how secured; our system; courses offered at the Pennsylvania State College.

WAYCHOFF, G. B., Jefferson, Greene County, Pa.:

1. CLOVER AS A SOIL RENOVATOR. (40 minutes.)

Seeding, care and causes of failure. How clover acts on fertility in the soil and gathers nitrogen from the air. Improves mechanical condition of soil.

2. USES OF LIME IN AGRICULTURE. (45 minutes.)

As plant food. Acts upon insoluble soil fertility. Corrects acidity. Compacts loose sandy soil. Loosens tough, heavy clay. Improves porosity.

3. BERRY CULTURE. (30 minutes.)

Selection and preparation of the soil. Where to obtain plants. Fertilizers. Setting plants. Cultivation. Pruning. Mulching. Gathering and marketing crop.

4. PROFITABLE GARDENING. (30 minutes.)

How products are grown, gathered and sold at a fair profit.

5. SOIL MOISTURE. (30 minutes.)

How water should be distributed in the soil. Best ways of controlling soil moisture. Interpretation of various moisture tests.

6. VALUE OF HUMUS IN CROP GROWING. (30 minutes.)

This topic will be a critical examination of numerous experiments to determine value of humus as a factor in profitable agriculture.

7. THE IDEAL EDUCATION. (Evening lecture.) (45 minutes.)

A plea for a more practical general education that will enable us to better solve life's problems, to enjoy nature's beauties and get more real good out of life.

DEPARTMENT LECTURERS.

In so far as time and circumstances permit, the officers of the Department of Agriculture are desirous of engaging in Institute work.

In order to prevent disappointment in the arrangement of programs, it is recommended that Institute Managers first consult the individual whose services they may wish to secure before placing his name on the program.

Department lecturers come to these Institutes free of charge, except that they are to be taken from and to the railroad station at the expense of local manager. The topics which they will discuss can be procured by addressing the following officers of the Department of Agriculture:

HON. N. B. CRITCHFIELD, Secretary of Agriculture.

HON. A. L. MARTIN, Deputy Secretary and Director of Institutes.

DR. B. H. WARREN, Dairy and Food Commissioner.

PROF. H. A. SURFACE, Economic Zoologist.

DR. LEONARD PEARSON, State Veterinarian.

BIOGRAPHICAL SKETCHES OF THE INSTITUTE LECTURERS.

S. F. BARBER was born in Union county, Pa., in 1855, was educated in the public schools and worked upon a farm until he was twenty-one. He then went into the mercantile business; 1877-8 was in the employ of the Buck Mountain Coal Company, in Luzerne county, as general manager of their company store, and in 1879-80 was in charge of the company store of the Stout Coal Company. Afterwards traveled in the West, particularly in Colorado, and then spent one year traveling for a dry goods firm in Philadelphia. In 1881 he settled down to farming, and has been engaged in that business ever since. His specialty is dairying, although he raises the general crops usual upon a Dauphin county farm.

RICHARD D. BARCLAY was born August 8, 1885, in Conshohocken, Pa.; attended Haverford School 1897 to 1900; B. D. in Agriculture the Pennsylvania State College 1905; assistant manager, estate and farm of Clement A. Griscom, Haverford, Pa., 1905. Practical work in bee-keeping, beginning April 1899; visited prominent bee-keepers in New England, 1903; traveled with Charles Stewart, New York State Bee Inspector, 1904; expert demonstrator United States Government Exhibit of Agricultural Colleges and Experiment Stations, Louisiana Purchase Exposition, 1904; secretary of the Pennsylvania State College Natural History Club 1902 to 1904; president, 1904-5; chairman executive committee of Pennsylvania State Bee-keepers' Association, 1904-5; member of National Bee-keepers' Association, and Phila Bee-keepers' Association; author of the Pennsylvania State College Correspondence Lessons on Bee-keeping, (1904). Apiaries at Riverton, N. J.; Haverford and West Chester, Pa.

DR. HARVEY B. BASHORE was born at West Fairview, Pa., July 31, 1864, attended Harrisburg Academy; graduated at Yale College 1886; graduated in medicine at University of Pennsylvania 1889, and spent three years in New York city studying hygiene and working in the various city hospitals; since

then has been practicing medicine in West Fairview, a suburb of Harrisburg; was appointed inspector for the State Board of Health, and is the author of "Outline of Rural Hygiene."

R. L. BEARDSLEE, of Warrenham, Pa., was born in 1835, received a liberal academic education, and among the studies pursued was a course in "Practical Agriculture." He began farming for himself at twenty years of age, as a dealer in cattle, and followed feeding and dealing in cattle until about 1864. He then included sheep in his stock business, and continued in this until the western trade reduced the profits, when he began dairying and put in forty cows. He has received as high as \$1,000 for a single load of butter. He rises from 1,600 to 1,800 bushels of grain each year, and sells about 1,000 pounds of washed wool and 150 lambs, annually, besides from 1,000 to 1,200 bushels of potatoes.

WM. C. BLACK was born on a farm in Mercer county; educated in the common schools and at Westminster College; a soldier in the Civil War; a teacher in the common schools and a farmer in his native county, raising general farm crops and breeding Shorthorn cattle. He has been a successful exhibitor of animals of his own breeding at the principal fairs in Western Pennsylvania. He has been a diligent reader of the best farm and live stock journals, visited some of the best farms and herds in the United States and Canada, and attended the great live stock exhibits.

M. S. BOND was born on a farm in Montour county, Pa., February 26, 1834; lived and worked on a farm until eighteen years old, then taught school seven years, then was employed as freight and passenger conductor for nine years, and traveled as lost freight and car tracer and purchasing agent for the Delaware, Lackawanna and Western Railroad Company for five years. Has been for over twenty-five years engaged in farming and market gardening; during a part of this time, engaged in breeding and raising blooded Jersey cattle and still keeps some of the best in the State; has made the raising of potatoes by the thousands of bushels a specialty for twenty-five years; has been and is now using more fertilizer to the acre than any man in his county, and is now making gardening a specialty.

C. W. BRODHEAD was born December 20, 1852, near White Haven, Luzerne county, Pa. He received a common school education; commenced to work in a horseshoeing and jobbing shop at 16 years of age; worked six years at the business before he knew anything about a horse's foot; then began to study anatomy and to dissect feet and legs, and has been a student of the best authors and in actual practice ever since; has one of the best libraries on animal and agriculture that can be had; is a registered specialist as a veterinary dentist and in animal castrations. He divides his time in the shop, in the care of a ten-acre vegetable garden, and reading for general information; takes great interest in farmers' organizations, trying to elevate their calling.

J. S. BURNS was born February 22, 1847, on the farm he now owns, near Clinton, Pa. His father died when he was seven years old, and from that time until he was twenty-one he worked upon the farm as hired help, receiving his board and clothing, and attending the public schools in the winter. His education received a brief finish at Linnean Academy, at Clinton. He was married when twenty-one, and soon after bought out the other heirs, and from the farm made the money that eventually paid for it. He has kept strict account of every item of income and expense since he was twenty-one years old, and to this habit of careful accounting he attributes much of his success. He has had large experience in the breeding and care of all lines of farm stock, but during recent years has given more special attention to the breeding of Poland-China swine, and raising mutton lambs, together with the growing of all the different crops usually raised on a Western Pennsylvania farm. He has had considerable experience as a correspondent upon agricultural topics, and for a number of years has taken an active part in the Institute work of this State.

GEORGE C. BUTZ was born in 1863, in New Castle, Pa. His father was a nurseryman and florist. His education consisted of a common, though excellent, public school, and later of a course through the high school. After this he was graduated from the Pennsylvania State College, in the class of '83. This was followed by post-graduate studies, and two years' experience in the fruit districts of Southern California. Since 1887 he has had charge of the horticultural work at the Pennsylvania State College and the State Experiment Station. For the past five years he has been one of the regular lecturers upon the State Institute force.

J. T. CAMPBELL was born in Springhill township, Fayette county, Pa., December 18, 1872; is the son of a prominent farmer; received his early education in the public schools of his native district; left the public schools with a

more than average education, and at once took up the study of agriculture at home, while working on his father's farm; he studied carefully all leading books and journals of his day. Married in 1894, and took up gardening and poultry culture, and was successful from the start. When the Pennsylvania State College started its Correspondence Course in Agriculture he took up the work and has since pursued same with diligence. Owns a large farm in Crawford county, upon which he has worked out many important agricultural problems. In poultry culture he has been especially successful, having made it a subject of special study, together with soil physics. Keeps in close touch with the State Experiment Station and the National Department of Agriculture; has written some for various agricultural and poultry journals.

M. N. CLARK was born near Export, Westmoreland county, Pa., July 16, 1848; received a good common school education, with several years at an academy and a full course at Duff's Commercial College, at Pittsburg; has always taken much delight in farming; is a close observer, and for many years has taken an active interest in agricultural affairs of his county; the cause of education has always found in him an earnest supporter; has been engaged in general farming from boyhood, except a few years spent in selling implements; was several seasons in the fruit-growing regions of the South, and there gained much information in the use of commercial fertilizers and fruit growing; has been a member of the State Board of Agriculture for eight years, and at present is looking after the interest of his farm.

WELLS W. COOKE was born in Massachusetts and educated at the public schools, the University of Iowa, Ripon College, Ripon, Wis., where he graduated in 1879, and the University of Vermont, in which latter institution he took a post-graduate course in chemistry. Had charge for four years of industrial farm schools in the West, and in 1886 was appointed professor of agriculture of the University of Vermont and director of the Vermont Experiment Station, holding both positions until 1893. During this time, for six years, had charge of the organizing and conducting of the Farmers' Institutes of the State. From 1893 to 1900 was professor of agriculture of the Colorado Agricultural College. The past three years has been connected with work of the Correspondence Course in Agriculture at the Pennsylvania State College.

JOHN W. COX was born near New Wilmington, Lawrence county, Pa., December 27, 1868; received a common school education and a course at Duff's Commercial College, Pittsburg; has spent all his life on the farm; is a breeder of Jersey cattle on his 200-acre farm, besides Barred Plymouth Rock poultry. Wheat, oats, corn, hay and potatoes are his principal crops; is much interested in the education of the farmers' children, and is serving his third three-year term as school director; is pursuing the Correspondence Course of the Pennsylvania State College.

NORMAN BRUCE CRITCHFIELD was born in Somerset county, July 20, 1838; was educated in the public and normal schools of his native county, and at the Ohio University, located at Athens, Ohio; he is by occupation a farmer; during the Civil War he served nine months in the One Hundred and Seventy-first Pennsylvania Militia, and at the close of his term entered the Twenty-eighth Pennsylvania Volunteers, with which regiment he continued until the close of the war; he has held in his own county the position of school director, county superintendent of public schools, prothonotary and clerk of courts; elected to the Senate, November 4, 1890; appointed judge in the Department of Agriculture at the World's Columbian Exposition in 1893, and served as vice president and chairman of the board of judges in said department; was re-elected to Senate in 1894, and appointed Secretary of Agriculture, February 24, 1903.

Z. T. CURE was born in 1848, and attended the public schools, including the city high school, until seventeen years of age, after which he taught school for five years, and has followed farming and stock raising ever since. His school training has been supplemented by extensive reading courses, which, by the aid of free translations, covered the subjects taught in college courses, with the exception of higher mathematics. As sources of information on the topics which he discusses, he depends upon experience and observation, aided by Prof. L. H. Bailey, of Cornell University, in the domain of horticulture and kindred subjects, and Andrew S. Fuller on the propagation of plants, etc., and other publications of authority, together with a careful perusal of the best agricultural periodicals of the day and a studious consultation of the latest bulletins of the Experiment Stations. He has had considerable experience in the discussion of literary and scientific subjects before teachers' institutes, and has made a careful study of the topics chosen to present at farmers' institutes.

J. D. DETRICH'S knowledge of agriculture, as a science, dates from 1882, since which time he has been availing himself of all the bulletins, magazines and books relating to soil, crops, dairying, breeding, feeding and rear-

ing of dairy animals. This, together with information furnished by the colleges and experiment stations, he has put into practice, and the result has been a satisfactory and profitable system of extensive farming.

W. M. C. DRAKE was born in Lawrence county, August 16, 1860. He was educated at the public schools and a normal school at New Castle, Pa., passing a teachers examination. He has spent all of life on the farm; was president of the Farmers' Alliance in Lawrence county one term. He has been for several years past in partnership with his brother, operating 600 acres of land besides a market garden and an extensive orchard.

WILLIAM FREAR was born in 1860, in Reading, Pa. He was educated in the public schools of that city and of Norristown, entered the preparatory and later the collegiate department of Bucknell University, grading in 1881; pursued a post-graduate course at Illinois, Wesleyan and Harvard Universities. Spent the growing season of the year during his childhood and youth at work upon a Pennsylvania farm; was made assistant chemist to the United States Department of Agriculture, 1883-5, and was engaged in sugar-beet products and cereals. In 1885 he was elected professor of agricultural chemistry in the Pennsylvania State College, and in 1887 was made vice-director and chemist to the Pennsylvania State College Experiment Station. In 1888 he was elected chemist to the Pennsylvania Board of Agriculture, and in 1895 chemist to the Pennsylvania Department of Agriculture. He was also president of the National Association of Agricultural Chemists, and has been one of the leading lecturers upon the State force of Farmers' Institutes.

HORACE H. HALL, of the "Triplet Oak Farm," was born on a farm near Coudersport, Potter county, Pa., in 1853. He received most of his education in the common schools, though he attended the Emporium graded and the Coudersport high schools for a limited time. He received his first teacher's certificate when twenty and taught in the schools of Potter county for twenty years, mostly in the district schools, though he served as principal of the Galeton and Oswayo graded schools. When not engaged in teaching, he worked at farming or in the lumber woods. At forty he turned his whole attention to farming, having bought 114 acres of bark slashing and woods, which he stocked with sheep while he was clearing and stumping, and in about ten years he has logged and stumped fifty acres, built substantial farm buildings, changed from a sheepman to a successful dairyman, and is a large producer of the finest strawberries.

JOHN W. HARSHBERGER, Ph. D., was born in Philadelphia, January 1, 1869. His early education was received in the public schools, terminating in his graduation from the Central High School of Philadelphia in 1888. He entered the University of Pennsylvania on a city scholarship, taking his B. S. there in 1892, and his Ph. D. in 1893, when he was made instructor in Botany, General Biology and Zoology, a position which he still holds. In addition, Dr. Harshberger has studied at Howard University and at Berlin, Germany, and has traveled extensively for botanical purposes in Mexico, the West Indies, California, Maine and Europe, where he carefully inspected the several noted botanical institutions. Dr. Harshberger has been identified with the American Society for the Extension of University Teaching, the Pacons Pines Summer School, the Department of Lecturers, University of Pennsylvania. He has been recorder of the botanical section of the Academy of Natural Science and a member of the more prominent botanical societies in America. His published works consist of "Maize; a Botanical and Economic Study," 1893, pp. 125, translated later in Mexico into Spanish; "The Botanists of Philadelphia and Their Work," 1899, pp. 457, forty plates, and "Students Herbarium for Descriptive and Geographic Purposes," 1901, pp. 210. He is botanical editor of a new American English Dictionary under course of publication by J. B. Lippincott Co., and is engaged at present in writing "An Introduction to the Phytogeography of North America" for a firm in Leipzig, Germany. His printed papers number above ninety, mainly on Botany and related subjects.

JOEL A. HERR was born in Clinton county, Pa., and educated in the public schools and at Dickinson Seminary. He served in the Civil War and has been a student, teacher and farmer all his life. He lives now on his farm and gives special attention to fruit culture and stock raising. He is a member of the State Board of Agriculture and a trustee of the Pennsylvania State College.

E. S. HOOVER was born in Lancaster county, Pa., in 1839; was educated in the public schools, White Hall Academy and the State Normal School at Millersville, taught school four terms, owns and controls a farm. Is engaged in general farming, at one time gave special attention to growing and feeding of live stock, especially in raising and training horses, and, later, devoted himself to the horticultural branch of agriculture. Acquired knowledge of agriculture by study, actual experience and experimenting. Is at

present time a member of the board of trustees of Millersville State Normal School; was a member of the Legislature, 1883-1884; has for some time and is at present engaged in Farmers' Institutes work.

GEORGE E. HULL, the subject of this sketch, a number of years ago moved upon a worn-out farm without buildings in Mercer county. By industry, perseverance and intelligent effort he has succeeded in restoring it to the highest state of fertility; has placed thereon substantial and convenient farm buildings, and educated his children, without other income than that derived from the farm. His silos, stock scales, farm implements and improved live stock are the admiration of all progressive farmers.

A. J. KAHLER was born in Hughesville, Pa., in 1834; was educated in the public schools and afterwards taught school in his native county; has always lived upon a farm; has filled every local office in his township; was a member of the Legislature in 1891-1892; was president for six years of the County Agricultural Society; is a member of the State Board of Agriculture and has been identified with most of the leading farm organizations of the State.

J. H. LEDY was born in Marion, Franklin county, Pa., August 3, 1864, and received his education in the common schools of Guilford township and at the Chambersburg Academy. After leaving school he engaged in the mercantile business for seven years at Marion and Waynesboro, Pa. In the spring of 1889 he accepted a position with S. Smucker & Co., wholesale grocers of Philadelphia. He remained with this firm four years, when he was elected register and recorded of Franklin county, after which he became half owner and business manager of the People's Register, of Chambersburg, an independent journal of large circulation. He now owns and superintends 151 acres of apple trees, inlaid with peaches and plums. Mr. Ledy is a practical fruit grower, who loves the work and has turned his whole attention to it.

L. W. LIGHTY was born in York county, Pa., in 1857; attended the public schools of his neighborhood; afterward attended a select school in Adams county and then taught school for seven winters. During this time he attended the York County Academy one term and also attended the State Normal School at Millersville. He then kept store, but not liking the business, he got out of it, and started in the poultry business, keeping both market and fancy poultry, and engaged in bee-keeping and the culture of small fruits. In 1893 he purchased the farm upon which he now lives. The land was worn out and the buildings quite dilapidated. He has improved this until it is now one of the best farms in his county. He has a large library of standard books, keeps a selected dairy of cows, and has all the modern improvements needed to equip a first-class farm.

M. S. McDOWELL was born in Mifflin county, Pa.; attended the public schools, and Lewistown Academy; entered Pennsylvania State College in 1888, and was graduated in '92; after graduation was connected with a fertilizer manufacturing establishment in Baltimore, and later came to the chemical department of the Experiment Station, with which he has been connected five years.

A. L. MARTIN was born near Mount Jackson, Lawrence county, Pa., in 1844; received his education in the public schools and at Poland (Ohio) College; served as school director in his native township and that of Little Beaver for eight years; filled the position of census enumerator in 1890; was elected to the House of Representatives in 1892, and served continuously until 1899; was during this continued service a member of the Agricultural Committee, and acting as its chairman in the session of 1897; by appointment of Governor Pattison, in 1893, became member of Farmers' National Congress and has been reappointed to same position by all subsequent Governors. Was appointed by Governor Stone, April 24, 1899, Deputy Secretary of Agriculture and Director of Farmers' Institutes for Pennsylvania, and reappointed by Governor Pennypacker, April 24, 1903.

PROF. FRANKLIN MENGES, Ph. D., was born forty-five years ago at Menges' Mill, York county, Pa., the first nineteen years of his life were spent on his father's farm, with all the ardour that farming meant in those days; he then began a course of preparation for college at the Baugher Academy, Hanover, Pa., and entered and graduated from Pennsylvania College, Gettysburg, with the class of 1886; was immediately tendered and accepted the position of assistant professor of chemistry in his alma mater, which position he held until 1896, when he came to York and took the professorship of the sciences in the York High School, which position he now holds; received the degree of Ph. D. from his alma mater for special work in chemistry, mineralogy and physics. He has for years been a student of the "Experiment Station Record," and has continued an interest in practical agriculture, and has lectured before Farmers' Institutes.

HENRY W. NORTHUP was born on a farm in Abington, once considered the banner agricultural township in Luzerne county; he was educated in the public schools and at Madison Academy. His chief business is that of farmer and dairyman; has been greatly benefited in his line of business for the last ten years by having associated with some of the best and most practical agriculturists in this and adjoining States in the institute work; has had some experience in fruit and market gardening and in the disposition of these products in the city of Scranton, where an excellent market has been secured.

T. E. ORR was born in Brooke county, Va., September 28, 1853. When nineteen years of age he was on the stock farms of his father and grandfather and attending country schools. From 1872 to 1876 he taught country school two winters and attended National Normal School balance of that time, graduating in 1875. Taught surveying and civil engineering in 1876-7. From 1877 to 1886 was superintendent or principal of the public schools as follows: Mount Vernon, Ind.; Le Mars, Iowa; Wellsburg, W. Va., and Bridgeport, Ohio, doing teachers' institute work each summer. Leaving Bridgeport in 1886, and at a salary of \$1,800 per year, he took an interest in the "National Stockman and Farmer," being one of its publishers and editors, which position he occupied until 1901, doing occasional Farmers' Institute work and acting as expert judge on poultry and live stock. Mr. Orr has always been closely identified with live stock and poultry associations.

WM. G. OWENS, of Bucknell University, was born in Union county; received his early education in the public schools of Lewisburg, Pittsburg and Allegheny City. Entered Bucknell University 1876; was graduated 1880; took his A. M. in 1883; taught in Bucknell University five years after graduation. In 1885 he became instructor in Natural Sciences. Took special work at Harvard and Berlin, Germany. In 1887 became professor of Chemistry and Physics, the position which he now holds. Has spent almost all his vacations on a farm and thus kept in close touch with nature.

J. H. PEACHEY was born in Mifflin county, Pa., in 1851. His boyhood was spent upon a farm; was educated in the public schools and graduated from the Ohio Normal University in 1881. After completing his course at school he followed teaching. In 1887 he began farming for himself and gave attention chiefly to raising hogs, sheep and cattle.

LEONARD PEARSON, State Veterinarian, was born in Indiana, August 17, 1868. In 1884 he entered Cornell University, and graduated in 1888 in the agricultural course. He graduated from the Veterinary Department of the University of Pennsylvania in 1890. During 1890-91 he attended lectures in the veterinary schools of Berlin and Dresden. In 1892 Dr. Pearson was appointed non-resident lecturer on veterinary science at the Pennsylvania State College. He was appointed State Veterinarian in 1896, was reappointed by Governor Stone, and immediately thereafter was elected secretary of the State Live Stock Sanitary Board. He was again reappointed by Governor Pennypacker, which position he still holds.

THOMAS J. PHILIPS was born upon a farm in Chester county, Pa., December, 1846; attended public and private schools and graduated from Bucknell University in 1867; spent three years in manufacturing iron, and traveling, and then settled upon the farm where he still lives, giving special attention to dairying and raising dairy stock, but devoting much of the 200-acre farm to the production of mixed crops, suitable to that location and market. That he has been a success is attested by the fact that he has been a director in a national bank for many years, a manager in one of the largest fire insurance companies in the State, and of a building and loan association; served two terms in the State Legislature, as a representative of the farming interests; he has contributed acceptably from time to time of his experience to the agricultural press, and in every way has kept in the front among the most progressive of his locality, believing in higher education, attractive country homes, and that success is the result of individual effort and judgment.

OLIVER D. SCHOCK was born on a farm near Hamburg, Berks county, Pa., in 1858, and has always taken a deep interest in agricultural and horticultural affairs. He was educated in the common and high schools, including a course in a commercial and scientific academy. At the age of fifteen he became a newspaper correspondent, and continues to represent leading daily papers and agricultural journals. For a number of years he served as a special agent of the Pennsylvania State Board of Agriculture, and later as a clerk in the office of the Board, assisting Secretary Edge. With the creation of the Department of Agriculture, in 1885, Governor Hastings promoted Mr. Sock to the position of Chief Clerk in that Department, which position he filled until July, 1899. After several years' experience in mercantile pursuits, he was appointed in the spring of 1903, under Governor Pennypacker's administration, to the position of assistant to B. H. Warren, Dairy and Food Commissioner of Pennsylvania, which position he now holds.

R. F. SCHWARZ was born near Berlin, Germany, in 1853; educated in Ducal Gymnasi and Ducal College, at Dessau. He came to New York in 1871, removed to Chicago in 1873, and in 1875 bought a farm in Monroe county, in this State, where he has since followed the business of fruit growing and market gardening, devoting at the present time about thirty acres to this pursuit. He was a member of the House of Representatives two terms, 1893 and 1895.

R. S. SEEDS was born in Huntingdon county, Pa., in 1852; was educated in the public schools and at the Shade Gap Academy. He was raised upon a farm and traveled for eighteen years among the farmers, selling agricultural implements. In 1892 he bought a farm that had been run down, which he has greatly improved.

W. H. STOUT was born October 18, 1840, in Lower Nazareth township, Northampton county, Pa.; was educated in the common schools and engaged in various occupations, serving an apprenticeship at coopering and milling, at clerkship and traveling salesman; has lived on his present farm for the past twenty-eight years, and is engaged in general farming, trucking, fruit growing and bee-keeping; has acquired practical and scientific information by observation and study; speaks English and German.

R. R. STUART was born on a farm in Clarion county August 31, 1869; attended public school and graduated from the Clarion State Normal School in 1892, and from Mount Hope College (Ohio) in 1899; has engaged in school teaching from the rural school to principal of the high school; has served in his township as collector, justice of the peace, town clerk, treasurer and secretary and treasurer of the school board. In 1892 he settled on the farm where he still lives, giving attention to raising swine and sheep. He has contributed frequently of his experience to the press, and in every way has kept among the front rank in the section where he lives, believing in the highest culture and the success that springs from individual effort.

HARVEY ADAM SURFACE, M. S., Economic Zoologist, was born on a farm in Warren county, Ohio, in 1867. He worked on the farm and attended and taught country school. He was educated in the Lebanon (Ohio) Normal, the Ohio State University, the University of Illinois, Hopkins (Stanford) California Seaside Laboratory and Cornell University. He taught in the Ohio State University, the University of the Pacific, Cornell, the Ithaca schools, teachers' institutes and the Pennsylvania State College. He held a fellowship in Cornell and was also appointed Dykman Research Fellow in Columbia University. He was field naturalist for the Illinois State Biological Station and University Extension lecturer in New York. He has also been lecturer in Zoology at the West Coast Chautauqua Assembly and scientific assistant on the United States Fish Commission. He has taught in every known grade of school work, and is noted for his enthusiasm and ability as a teacher, speaker and writer. He is ornithologist of the Pennsylvania State Board of Agriculture, and is making investigations of insects for the Pennsylvania State Department of Agriculture and of fishes for the Pennsylvania State Fish Commission. Among his writings are articles on nature study, zoology, mollusks, insects, fishes, birds, mammals, pedagogy, anatomy, etc. He is nature study editor of the "Popular Educator," ornithological editor of "American Gardening," member of the American Society of Naturalists, American Association for the Advancement of Science, the American Ornithologists' Union, the Pennsylvania State Audubon Society, etc. He makes a specialty of the biologic and economic features of his subjects. He was appointed Economic Zoologist by Governor Pennypacker in 1903.

DR. I. A. THAYER was born near Warren, Ohio, in November, 1840. He was reared on a farm of which he was foreman for a number of years under a scientific and successful farmer; was educated in Hiram College, under the presidency of General Garfield. He graduated in medicine in 1866, and practiced that profession several years. Since laying down that practice he has been engaged in public speaking, having, during fifteen years, filled important lecture engagements from Boston to St. Louis, under the management of the leading lyceum bureaus. He has recently finished the course in crop production and that in live stock production in our State College. For nine months in the year his time is given wholly to his farming operations, for years, conducting a veritable experiment station where he has worked with a book in one hand and a hoe in the other; hence, he is equipped with a practical knowledge that he has the ability to express in the clearest manner.

F. J. WAGNER was born on a farm near Claridge, Pa., in 1868; received a good common school education and later a course at a business college. Taught public school two terms and since has been regularly engaged in farming, devoting particular attention to dairying and the breeding of fine Jersey cattle. A few years ago he took up the Correspondence Course of the Pennsylvania State College, and has completed the course in Grain, Crops, Clovers, Grapes, Farm Manures and Stock Feeding.

MRS. MARY A. WALLACE is a daughter of the late Chester W. Ballou, Esq., one of the most successful and progressive of the pioneer farmers of Lawrence county, Pa. She was educated in the public schools and Beaver Seminary, Beaver, Pa., and previous to her marriage taught school in her home district. Later, to her household duties, she added newspaper work, and became widely known in literary and journalistic circles through her pen name, "Aunt Patience." Mrs. Wallace was a charter member of the Pittsburg Women's Press Club, and was its treasurer for a number of years. She is also prominent in patriotic societies, and is a honorary member of the One Hundredth Pennsylvania Volunteer (Roundhead) Association. She is in demand as a speaker for Memorial Day and is already engaged for next year. Her home is on a farm near Ellwood City, Pa.

R. L. WATTS was born at Kerrmoor, Pa., July 5, 1869; raised on the farm of his father, Martin Watts, which farm was largely devoted to fruit culture. Entered Pennsylvania State College in 1887 and graduated from the agricultural course in June, 1890. He was elected assistant instructor in Botany and Horticulture of the University of Tennessee and horticulturist of the Agricultural Experiment Station of this institution in September, 1890. Later he was made instructor of Horticulture, followed by assistant professor of Horticulture and secretary of the Experiment Station. Besides the regular duties as secretary, he had charge of the Farmers' Institutes of the State, held under the auspices of the university and station; he prepared programs, conducted correspondence and participated in the meetings. While at the station he conducted various experiments with fruits and vegetables in the greenhouse and out of doors, the results of which have been published in bulletin form. He wrote Farmers' Bulletin No. 39 on "Onions," for the United States Department of Agriculture. For several years he was editor of the fruit and vegetable department of the "Southern Florist and Gardener;" he is now engaged in gardening.

D. H. WATTS was born near Kerrmoor, Pa., May 25, 1861; was raised on the farm of his father, Martin Watts, and educated in the public schools, which schooling was supplemented by a few months attendance at the Indiana State Normal School. He has always been interested in farmers' organizations and served two years as president of the Clearfield County Agricultural Society. He located upon his farm in 1886 and erected thereon modern buildings and established a dairy plant, where fine butter for a special trade is produced. The growing of fruits is also a specialty. On his farm, known as "Orchard View Farm," there are 3,000 apple, peach, pear and plum trees, all his own selection and planting.

G. B. WAYCHOFF was born and raised on a farm; was educated in public schools, and attended Monongahela College, graduating in the scientific course. Taught several years in public schools; also taught in Monongahela College, in Beaver College and in Beaver High School, and has had considerable experience in public speaking. At the age of twenty-three he bought a poor and almost abandoned farm, and by drainage, liming and raising clover, together with good tillage, it has been brought up to a good degree of productiveness.

CROP REPORT.

In no year for which we have an authentic crop report can such remunerative prices be quoted or products grown upon the farms of Pennsylvania. Farm help has been scarce and wages high, but the use of machinery has increased the power of one man on the farm, so that equals that of seven men under the old régime. The following report for the year 1906 is most encouraging:

CROP REPORT FOR 1906.

Giving Prices of Farm Products and Live Stock, with Farm Wages and Board, in Pennsylvania, by Counties. Collected by
A. L. Martin, Deputy Secretary of Agriculture.

Counties.	Cereals.				Hay.		Live Stock.									
	Wheat.	Corn.	Oats.	Rye.	Buckwheat.	Hay, clover.	Hay, timothy.	Horses, average.	Mules, average.	Cows, average.	Lambs, average.	Swes, average.	Steers, fat, per pound.	Steers for feeding, per pound.	Swine, shoats, per pound.	Pat hogs, per pound.
Adams,	\$0 72	\$0 50	\$0 33	\$0 50	\$0 70	\$0 50	\$0 50	\$130 00	\$150 00	\$35 00	\$4 50	\$4 50	\$0 05	\$0 04	\$0 06	\$0 08
Allegheny,	73	60	40	10 50	60	10 50	13 00	135 00	170 00	45 00	5 00	5 00	06	06	04	06
Armstrong,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Beaver,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Bedford,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Berks,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Bucks,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Butler,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Camden,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Carlisle,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Centre,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Chester,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Clarion,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Clearfield,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Columbia,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07
Crawford,	76	60	40	12 00	60	12 00	13 00	135 00	170 00	45 00	5 00	5 00	06	04	06	07

[illegible]

CROP REPORT FOR 1906—Continued.

Counties.	Live Stock.		Vegetables, Fruit, Etc.														
	Chickens, dressed, per pound.	Chickens, live, per pound.	Apples, per bushel.	Peaches, per bushel.	Pears, per bushel.	Plums, per quart.	Cherries, per quart.	Blackberries, per quart.	Raspberries, per quart.	Potatoes, per bushel.	Butter, per pound, at store.	Butter, per pound, at market.	Milk, wholesale, 100 pounds.	Milk, retail, per quart.	Eggs, per dozen.	Tobacco, leaf, per pound.	Honey, per pound.
Adams.	\$0 11	\$0 10	\$0 50	\$0 50	\$0 45	\$0 05	\$0 05	\$0 05	\$0 05	\$0 55	\$0 20	\$0 20	\$0 80	\$0 05	\$0 20	\$0 12	\$0 20
Allegheny.	15	12	52	52	40	10	08	09	08	60	26	32	1 00	06	22	18	18
Armstrong.	16	11	54	54	40	10	08	09	08	60	24	26	1 30	07	23	22	22
Beaver.	18	13	65	65	49	10	10	10	10	65	25	25	1 50	06	23	22	22
Bedford.	15	10	35	35	40	05	05	05	05	50	22	24	1 10	06	24	24	24
Berks.	15	10	55	55	40	07	07	06	06	65	22	24	1 10	06	24	24	24
Blair.	15	10	55	55	40	07	07	06	06	65	22	24	1 10	06	24	24	24
Bradford.	18	10	45	45	80	08	08	05	05	50	24	24	1 10	06	21	23	23
Bucks.	15	10	50	50	65	05	05	06	06	50	24	24	1 10	06	21	23	23
Butler.	14	11	75	75	50	06	06	06	06	50	24	24	1 10	06	21	23	23
Cambria.	16	12	50	50	1	05	05	06	06	50	24	24	1 45	05	21	23	23
Cameron.	18	12	60	60	2	00	00	00	00	50	24	24	1 45	05	21	23	23
Carbon.	17	12	75	75	1	00	00	00	00	50	24	24	1 45	05	21	23	23
Centre.	17	13	75	75	1	00	00	00	00	50	24	24	1 45	05	21	23	23
Chester.	17	13	75	75	1	00	00	00	00	50	24	24	1 45	05	21	23	23
Clearfield.	17	13	75	75	1	00	00	00	00	50	24	24	1 45	05	21	23	23
Columbia.	17	11	50	50	1	00	00	00	00	50	24	24	1 45	05	21	23	23
Crawford.	15	10	40	40	1	00	00	00	00	50	24	24	1 45	05	21	23	23
Cumberland.	15	10	50	50	1	00	00	00	00	50	24	24	1 45	05	21	23	23
Dauphin.	15	12	40	40	1	00	00	00	00	50	24	24	1 45	05	21	23	23
Delaware.	13	10	45	45	1	00	00	00	00	50	24	24	1 45	05	21	23	23
Elk.	18	12	50	50	1	00	00	00	00	50	24	24	1 45	05	21	23	23

	15	10	50	60	1 60	66	68	67	68	50	(24)	28	2 20	66	24	14
Erie,	18	14	75	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Fayette,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Forest,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Franklin,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Groton,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Groton,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Holland,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Indiana,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Jefferson,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Junata,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Lackawanna,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Lancaster,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Lavaca,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Lebanon,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Lehigh,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Luzerne,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Lycoming,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Mechanic,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Mercer,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Millin,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Monroe,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Montgomery,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Montour,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Northampton,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Northumberland,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Perry,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Philadelphia,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Pike,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Potter,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Schenck,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Schuykill,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Somerset,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Sullivan,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Susquehanna,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Tioga,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Union,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Venango,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Warren,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Washington,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Wayne,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Westmoreland,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Wyoming,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
York,	18	14	40	1 25	1 60	66	68	67	68	75	28	30	2 60	67	24	14
Average,	\$0 15	\$0 11	\$0 55	\$1 10	\$3 90	\$0 67	\$0 67	\$0 67	\$0 68	\$0 60	\$0 23	\$0 27	\$1 50	\$0 66	\$0 25	\$0 13

CROP REPORT FOR 1906—Continued.

Counties.	Wool.						Farm Land, Value per Acre.		Farm Wages.						
	Short, unwashed.	Short, washed.	Medium, unwashed.	Medium, washed.	Long, unwashed.	Long, washed.	Improved.	Average.	By year, with board.	Summer months only.	By day, with board.	By day, without board.	Whole year, without board.	Harvest, by day.	Household help, female, with board, per week.
Adams.	\$0 25	\$0 30	\$0 22	\$0 25			\$25 00	\$25 00	\$150 00	\$18 00	\$1 00	\$1 27	\$250 00	\$1 50	\$2 50
Allegheny.	25	34	25	34			125 00	125 00	250 00	25 00	1 00	1 50	270 00	1 50	3 50
Armstrong.							45 00	30 00	200 00	20 00	1 10	1 50	300 00	1 10	2 00
Baldwin.							60 00	40 00	150 00	25 00	1 00	1 50	250 00	1 10	2 00
Berks.	26	30	25	30	30 25	\$0 33	40 00	30 00	180 00	20 00	1 00	1 25	240 00	1 10	2 00
Bethel.							60 00	40 00	180 00	20 00	1 00	1 25	240 00	1 10	2 00
Blair.	30	33	28	31	35	40	65 00	45 00	200 00	22 00	1 25	1 40	280 00	1 20	2 00
Bradford.	30	32	32	35	35	38	85 00	25 00	216 00	23 00	1 00	1 50	360 00	1 10	2 00
Bucks.	30	32	32	35	35	38	85 00	55 00	200 00	20 00	1 25	1 50	360 00	1 10	2 00
Butler.	27	31	28	27	30	38	60 00	30 00	240 00	26 00	1 25	1 50	360 00	1 10	2 00
Cambria.							35 00	20 00	280 00	25 00	1 00	1 50	360 00	1 10	2 00
Cameron.							35 00	40 00	200 00	25 00	1 00	1 50	360 00	1 10	2 00
Carbon.							35 00	40 00	200 00	25 00	1 00	1 50	360 00	1 10	2 00
Centre.							35 00	40 00	200 00	25 00	1 00	1 50	360 00	1 10	2 00
Chester.							35 00	40 00	200 00	25 00	1 00	1 50	360 00	1 10	2 00
Clarion.	25	30	26	25	30	35	40 00	30 00	260 00	20 00	1 00	1 50	240 00	1 10	2 00
Clearfield.							50 00	30 00	250 00	25 00	1 00	1 25	300 00	1 10	2 00
Columbia.	18	25	16	18	22	28	50 00	30 00	180 00	18 00	1 00	1 50	200 00	1 10	2 00
Crawford.							40 00	25 00	180 00	16 00	1 10	1 40	250 00	1 10	2 00
Cumberland.	25	34	26	34	27	35	45 00	25 00	180 00	16 00	1 00	1 50	300 00	1 10	2 00
Cumpleland.							80 00	60 00	200 00	20 00	1 1	1 50	300 00	1 10	2 00

The following gives the acreage, amount produced and value of Cereals and Hay grown in Pennsylvania; also the number and value of the different Farm Animals, and Pennsylvania's rank among the different states of the Union for the various products enumerated, in the year 1905.

CEREALS, HAY AND FARM PRODUCTS.

	Acreage.	Production.	Value.	Standing.
Rye,	316,265	5,885,505 bushels.	\$3,825,228	1st.
Potatoes,	253,997	22,841,730 bushels.	14,847,124	2nd.
Buckwheat,	232,398	4,647,960 bushels.	2,602,858	2nd.
Wheat,	1,629,279	27,860,670 bushels.	24,238,784	8th.
Corn,	1,411,997	36,085,993 bushels.	30,286,388	11th.
Oats,	1,161,186	29,480,324 bushels.	14,212,917	6th.
Hay,	3,072,021	4,608,052 tons.	54,973,822	2nd.
Eggs,			15,000,000	
Total,			\$159,987,121	

FARM ANIMALS.

	Number.	Value.	Standing.
Horses,	656,106	\$67,296,787	6th.
Mules,	40,459	4,302,002	13th.
Milch cows,	1,097,590	37,647,337	3rd.
Other cattle,	867,426	15,093,286	17th.
Sheep,	1,192,658	5,102,529	8th.
Hogs,	999,686	8,447,312	12th.
Poultry,		4,483,486	4th.
Total,		\$142,372,840	

The following comparison of these tables for the past four years shows an almost uniform advance in the various products of Pennsylvania :

TABLE OF COMPARISON.

	1902.	1903.	1904.	1905.	1906.
Wheat,	\$0.73	\$0.75	\$1.08	\$0.83	\$1.78
Corn, .....	.45	.57	.62	.57	.55
Oats, .....	.37	.41	.44	.37	.40
Rye, .....	.53	.60	.70	.63	.61
Buckwheat, .....	.43	.57	.58	.56	.58
Hay, clover,	9.43	11.49	10.50	10.00	11.07
Hay, timothy,	10.47	11.00	12.00	12.00	13.50
Horses, average,	84.00	115.00	120.00	131.00	145.00
Mules, average,	77.00	120.00	125.00	139.00	157.00
Cows, average,	28.00	31.00	35.00	35.00	38.00
Lambs, average,	2.76	3.50	3.50	3.95	4.15
Ewes, average,	2.81	3.15	3.50	4.10	4.50
Steers, fat, per pound, .....	.05	.04	.04½	.04	.05
Steers, for feeding, per pound, .....	.03	.03	.03½	.03	.04
Swine, shoats, per pound, .....	.06	.06	.06	.05	.06
Hogs, fat, per pound, .....	.06	.06	.06½	.06	.07
Chickens, dressed, per pound, .....	.11	.11	.13	.15	.15
Chickens, live, per pound, .....	.08	.10	.10	.10	.11
Apples, per bushel, .....	.25	.50	.44	.70	.75
Peaches, per bushel, .....	.75	1.15	.82	.90	1.10
Pears, per bushel, .....	.81	.38	.94	.90	.90
Plums, per quart, .....	.06	.07	.08	.07	.07
Cherries, per quart, .....	.06	.08	.08	.08	.07
Blackberries, per quart, .....	.07	.07	.08	.07	.07
Raspberries, per quart, .....	.08	.08	.09	.08	.08
Potatoes, per bushel, .....	.50	.58	.52	.59	.60
Butter, per pound, at store, .....	.18	.24	.22	.22	.23
Butter, per pound, at market, .....	.22	.24	.24	.25	.27
Milk, whole-sale, per 10 pounds,	1.16	1.41	1.70	1.30	1.50
Milk, retail, per quart, .....	.05	.05	.05	.05	.06
Eggs, per dozen, .....	.18	.22	.24	.24	.25
Wool, short, unwashed, .....	.16	.18	.21	.25	.25
Wool, short, washed, .....	.17	.24	.28	.31	.30
Wool, medium, unwashed, .....	.17	.18	.22	.26	.26
Wool, medium, washed, .....	.20	.25	.30	.32	.32
Wool, long, unwashed, .....	.15	.19	.21	.29	.30
Wool, washed, .....	.24	.25	.31	.34	.34
Farm land, improved, value per acre,	49.00	56.50	57.00	55.00	60.00
Farm land, value per acre, average,	33.00	39.00	37.00	35.00	40.00
Farm wages by year, with board,	153.00	187.00	185.00	190.00	210.00
Farm wages, summer months only,	17.00	24.00	20.00	19.00	21.00
Farm wages by day, with board, .....	.85	1.00	1.00	1.00	1.10
Farm wages, by day, without board,	1.15	1.40	1.35	1.35	1.40
Farm wages, whole year, without board,	196.00	280.00	300.00	215.00	300.00
Farm wages, harvest, by day,	1.23	1.55	1.60	1.60	1.65
Farm wages, household help, female,	2.05	2.25	2.50	2.50	2.50

AGRICULTURAL SOCIETIES.

A word of commendation is due the management of the County Agricultural and Horticultural Societies of the State in, that former objectionable amusements have been practically eliminated from these exhibitions and greater encouragement and larger premiums offered for farm products and animal entries; also the employment of expert judges to pass upon the merits of the various exhibits is rapidly becoming a means of educating the farmer as to the points of merit in the articles placed in competition.

The attendance for 1905 was 975,100, previous year 1,267,803, making a decrease of 292,703; total membership, 11,015, previous year, 10,513, making an increase of 502; paid-up membership fees, \$7,530.00, previous year, \$11,392.17, making a decrease of \$3,862.15; amount paid in premiums, \$116,093.32, previous year, \$101,326.46, making an increase of \$14,766.86; amount offered premiums this year, \$143,460.00, previous year, \$102,100.00, making an increase of \$41,360.00.

Clinton,	Clinton County Agricultural Society,	32,000	½ mile,	25	300 00	6,251 74	7,000 00	Bloomsburg,	No fair.
Columbia,	Columbia County Agricultural, Horti- cultural and Mechanical Association.	10,000	1-3 mile,	300		1,000 00	1,500 00	Cambridge Springs,	Oct. 21-24.
Crawford,	Central Crawford Agricultural Society.	18,000	½ mile,		Stock co.	4,000 00	4,000 00	Carlisle,	Sept. 25-28.
Cumberland,	Agricultural Association of Cumberland County.	4,000	½ mile,					Hogestown,	June 14.
Cumberland,	Hogestown Horse and Cattle Show,	25,000	½ mile,		Stock co.		2,000 00	Middletown,	Sept. 4-7.
Dauphin,	Middletown Fair Association,	7,000	½ mile,	341	1,450 00	820 00	850 00	Wattsburg,	Sept. 4-7.
Dauphin,	Graetz Agricultural and Horticultural As- sociation.	6,000	1-3 mile,	29	150 00	2,500 00	2,500 00	Carmichaels,	No fair.
Erie,	Wattsburg Agricultural Society,	40,000	½ mile,	89		2,000 00	2,000 00	Indiana,	Sept. 4-7.
Forest,	Forest County Agricultural Society,	20,000	½ mile,					Brookville,	Sept. 4-7.
Greene,	Greene County Agricultural and Manufac- turing Society.	10,000	½ mile,	114		900 00		Port Royal,	No fair.
Indiana,	Indiana County Agricultural Society,	20,000	½ mile,	250				No fair.	Sept. 12-14.
Jefferson,	Jefferson County Agricultural and Driving Park Association.	10,000	½ mile,					No fair.	No fair.
J. J. ferson,	Punxsutawney Fair Association,							No fair.	No fair.
Junata,	Junata County Agricultural Society,							No fair.	No fair.
Lackawanna,	Lackawanna County Agricultural Society,							No fair.	No fair.
Lackawanna,	Maitland Driving Park and Agricultural Society.							No fair.	No fair.
Lackawanna,	Lackawanna Grange Fair Association,							No fair.	No fair.
Lancaster,	Lancaster County Agricultural and Horti- cultural Society.							No fair.	No fair.
Lawrence,	Lawrence County Agricultural and Farmers' Institute.	18,000	½ mile,		Stock co.	4,500 00	4,500 00	Pulaski,	Sept. 18-20.
Lawrence,	Pulaski Fair Association,	15,000	½ mile,			3,000 00		Lebanon,	Aug. 28-31.
Lebanon,	Lebanon Valley Fair Association,							No fair.	No fair.
Lebanon,	Lebanon County Agricultural and Horti- cultural Association.	17,500	½ mile,	884		2,500 00	2,500 00	Allentown,	Sept. 18-21.
Lehigh,	Lehigh County Agricultural Society,	15,000	½ mile,	253	Stock co.	1,400 00	5,400 00	Dallas,	Oct. 2-5.
Luzerne,	Dallas Union Agricultural Association,	12,000	½ mile,	80	8,000	2,000 00	3,000 00	Hughesville,	Sept. 28.
Lycum,	Muncy Valley Farmers' Club,	24,000	½ mile,		Stock co.	2,500 00	3,000 00	Stonessboro,	Sept. 25-27.
Mercer,	Mercer County Agricultural Association,	24,000	½ mile,			2,904 00		Mercer,	Sept. 4-5.
Mercer,	Mercer Central Agricultural Society,	15,000	½ mile,		Stock co.	2,000 00	2,500 00	Stroudsburg,	Aug. 28-31.
Monroe,	Monroe County Agricultural Society,	55,000	½ mile,	325		10,106 16	10,600 00	Nazareth,	Sept. 11-14.
Northampton,	Northampton County Agricultural Society,	50,000	½ mile,			3,000 00	3,500 00	Bethlehem,	Sept. 4-7.
Northampton,	Pennsylvania State Fair Association,	22,000	½ mile,	40		3,500 00	3,500 00	Milton,	Oct. 2-5.
Northumberland,	Milton County Agricultural,	6,000	½ mile,	300				Newport	Sept. 17-20.
Perry,	Perry County Agricultural Society,								

List of County and Local Agricultural Societies, with Names and Addresses of Presidents and Secretaries and Dates for Holding Fall Exhibitions of 1906, Etc.—Continued.

County.	Corporate Name of Society.	Attendance, 1905.	Race track.	Membership.		Premiums.		Held 1906.	
				Number.	Fee.	Paid, 1905.	Offered, 1906.	Place.	Date.
Philadelphia,	Pennsylvania Horticultural Society,	1,500	.....	876	2,400 00	2,640 00	2,760 00	Horticultural Hall, Philadelphia.	Nov. 6-10.
Schuylkill,	Orwigsburg Agricultural and Horticultural Society.	.....	.....	29	.....	.....	.....	.....	No fair.
Somerset,	Somerset County Agricultural Society, .....	.....	.....	25	15 00	.....	.....	.....	No fair.
Sullivan,	Sullivan County Agricultural Society,	4,600	1-3 mile.	51	.....	275 25	.....	Forksville,	Oct. 3-5.
Susquehanna,	Susquehanna County Agricultural Society,	5,000	.....	46	10 00	700 00	700 00	Montrose,	Sept. 12-13.
Susquehanna,	Susquehanna County Agricultural Society,	3,000	.....	.....	.....	900 00	900 00	Harford,	Sept. 19-20.
Tioga,	Cowaneseque Valley Agricultural Society,	14,000	1½ mile.	50	.....	1,500 00	1,500 00	Westfield,	Sept. 11-14.
Tioga,	Snythe Park Association,	45,400	1½ mile.	117	Stock co.	1,600 00	1,900 00	Mansfield,	Sept. 13-21.
Tioga,	Tioga County Pomona Grange No. 30, .....	.....	1½ mile.	600	240 00	.....	.....	Wellsboro,	No fair.
Union,	Union County Agricultural Society,	30,000	1½ mile.	202	Stock co.	3,000 00	3,000 00	Lewisburg,	Sept. 25-28.
Washington,	Union Agricultural Association,	20,000	1-3 mile.	2,000	Stock co.	3,000 00	Not decided.	Burgettstown,	Oct. 2-4.
Warren,	Warren County Farmers' and Breeders' Association.	.....	.....	60	30 00	.....	.....	.....	Not decided.
Wayne,	Wayne County Agricultural Society,	13,000	1½ mile.	.....	.....	1,800 00	2,800 00	Honesdale,	Oct. 2-4.
Westmoreland, ..	Westmoreland Agricultural Society,	15,000	1½ mile.	81	25 00	1,400 00	Not decided.	Youngwood,	Sept. 11-14.
Wyoming,	Wyoming County Agricultural Society, .....	.....	1½ mile.	60	.....	.....	.....	Tunkhannock,	Sept. 19-21.
York,	York County Agricultural Society,	\$2,500	1½ mile.	203	.....	4,600 00	9,000 00	York,	Oct. 1-5.
York,	Hanover Agricultural Society,	30,000	1½ mile.	100	Stock co.	2,300 00	4,000 00	Hanover,	Sept. 11-14.
Total,		975,100	.....	11,015	\$7,530 00	\$116,000 36	\$143,460 00	.....	.....

Note.—Where dates, etc., are omitted, no replies to requests for same were received by this Department.

CONCLUSION.

The institutes have been, in a measure, handicapped the past four years for want of funds sufficient to carry on the work in a manner commensurate with the demands of the times or conditions surrounding agriculture in the different counties of the State. With the increased cost of travel, hotel rates, increased at least 30 per cent. above that of previous years, we find it impossible to meet the demands for more competent instructors and added number of meetings, with the appropriation granted heretofore; hence we earnestly voice the will of the more than a million of farmers' of Pennsylvania in asking that Fifty Thousand dollars be appropriated to the Division of Farmers' Institutes for the coming two years.

Very Respectfully,

A. L. MARTIN.
Director of Institutes.

REPORT OF THE DAIRY AND FOOD COMMISSIONER.

HARRISBURG, PA., *December 31, 1906.*

Hon. N. B. Critchfield, *Secretary of Agriculture, Harrisburg, Pa.:*

Dear Sir: I have the honor to transmit to you the annual report of the Dairy and Food Division of the Department of Agriculture, the same representing in a measure, a brief synopsis, in somewhat epigrammatical form, some of the work and features incidental to the operations of the fourth year of my official term under the present administration.

It is almost needless to explain that the active policy inaugurated at the commencement of my term of office has not at any time been permitted to lag nor relinquish, although the enforcement of our tried and beneficial dairy and food legislation now on the statutes met with even greater resistance and more complicated legal obstructions than at any previous period since their enactment.

In view of the large number of prosecutions which were brought throughout the various counties of the Commonwealth, this development was not at all surprising. Generally speaking, the press and the public supported and encouraged the campaign for pure food and genuine dairy products, consequently there are no apologies to offer at this time.

That the present market conditions, without exceptions, show that the adulterated, counterfeit, deleterious and illegal food and dairy products are far less common than formerly, so far as Pennsylvania is concerned, is self evident, and that those who manufacture such goods naturally oppose the laws cannot be controverted. Time and practical experience developed the necessity for this rigid enforcement of the law, but the main effort was to protect the consumer against illegal products, while all concerned were accorded fair and impartial consideration, whether retailer, jobber or manufacturer. There were no set or fixed rules and regulations formulated for the benefit of any class, and as the records of the past year will prove, the several laws placed under the jurisdiction of the Dairy and Food Division were enforced in their entirety, and according to the interpretation originally intended by the Legislature. In other words, it did not appear proper nor wise to add to nor detract from their intended meaning and power by adding a code of rules of perhaps doubtful propriety.

DIFFICULTIES IN ENFORCING FOOD LAWS.

While possibly the bulk of the legitimate trade were willing and rendered invaluable help and support, another class of producers remained antagonistic. This is a natural sequence, and it would be

possible to present a list of considerable magnitude representing certain firms and individuals who were driven from the markets of Pennsylvania, because of the persistency with which dealers handling such inferior and adulterated products were prosecuted by the State authorities. They learned and fully understood that such forbidden articles had no legal status in Pennsylvania.

RETAIL MERCHANTS' OBJECTIONS TO THE LAW.

The retail merchants of Pennsylvania have entered strenuous protests against the enforcement of the Pure Food Act of June 26, 1895, claiming that the jobber or manufacturer should in all cases be regarded as the violator of the law and subjected to its penalties, since the small dealer had no way to determine the purity of the goods handled by him. While this argument is plausible, such retail dealers could very readily purchase under a written guarantee as to the purity and legality of the merchandise sold to them for retailing, and in that manner secure immunity against financial loss, and at the same time have the indirect assurance of increased purity and a higher standard of merit.

The purity and wholesomeness of foods sold in Pennsylvania has undoubtedly shown a remarkable change for the better as compared with the conditions which existed four years ago. If other States wilfully enact laws which are detrimental to public health, or if good laws are neglected through their non-enforcement, this Commonwealth will positively continue its present activity so long as may be necessary.

NATIONAL FOOD AND DRUGS ACT.

The enactment of a National Pure Food and Drugs Act has brought a new issue, and while many of its leading features partake largely of the Pennsylvania Pure Food Law, approved June 26, 1895, this Commonwealth will continue its present policy until the present law is repealed or supplemented by other pure food legislation. It is probable that the laws will be amended or modified during the legislative session of 1907, as various important commercial interests are already clamoring for such changes as would make the Pennsylvania law conform more strictly with the National statute. This movement may not strengthen or improve conditions, so far as the consumer is concerned, and a cautionary signal is therefore not inappropriate. The National authorities might be able to render help, so far as standards for foods are concerned, but it is not at all probable that the present efficacy of the State's legislation would be advanced by the proposed new laws, excepting perhaps, in protecting retailers.

NEED FOR PHYSIOLOGICAL TESTS.

One of the important and needful requirements of pure food devotees are more physiological tests to establish the harmfulness or wholesomeness of food products. The National Government established a series of experiments, with results that have only awakened an increased interest, which fact bodes well for the success of future experiments and researches. That the continued use of chemical preservatives and coal tar dyes is injurious to health cannot be successfully controverted. Both human beings and animal life of the low-

er orders responded with almost invariable direful effects where such experimentation was made. The use of alleged "harmless" coloring material in articles of food was especially prolific of unfavorable physiological results, and too much caution can scarcely be exercised.

The several chemists of the Dairy and Food Division will probably make a thorough investigation into the use of the coloring materials commonly employed by manufacturers of food and articles of drink in the near future. A classification of the poisonous and non-poisonous groups of colors and dyes—whether mineral or vegetable, could not be otherwise than helpful and valuable.

LEGAL MEASUREMENT OF MILK.

During the past year a considerable correspondence was created relative to the subject of the proper standard measurement of milk and cream. The producers of South eastern Pennsylvania were especially emphatic in their denunciation of dairymen and dealers who insisted in demanding dry measure when purchasing their supplies, while they sold only by liquid measures, that is, 231 cubic inches per gallon, thus realizing a very large gain in this difference alone. That such action is unjust and irregular, to use mild language, is very clear, and it is to be earnestly hoped that the next session of the legislature will enact a law that will remedy the wrong, and give to all parties concerned just and legal measure. False weights and measures are an abomination, dating back to Biblical days, and they should not be tolerated now. Another imposition that is largely practiced even where least suspected is the too common use of short measure bottles by dairymen in dispensing milk and cream.

ORDERING SHORT MEASURE MILK BOTTLES.

The manufacturers of bottles have carefully graded their goods, and the milkmen simply indicate when ordering stock whether they desire regular quart and pint size bottles, or those containing anywhere from one-half to three ounces less than the legal quart measure. Though in blissful ignorance, the consumer is defrauded, and in the aggregate, pays a homage to the dishonest dealer that is very considerable, indeed. This is another wrong that requires attention at the hands of the Legislature.

THE USE OF SUGAR SUBSTITUTES.

The continued use of imitation sugar products has been brought to the attention of the Dairy and Food officials at more or less regular intervals. Saccharin and other sugar substitutes, said to be "more than 550 times sweeter than sugar," are used only too freely by manufacturers of soft drinks and certain canned vegetables. As coal-tar derivatives, such "sweeteners" are pronounced by those regarded as high authorities as being not only deceptive but positively harmful.

It is proper to state that the Dairy and Food authorities of Pennsylvania have never sanctioned the use of such articles. Their use is urged on the plea of economy, and the consumer too often encourages it to his own detriment, because of the inordinate desire to purchase too cheaply, and regarding quality of only secondary or minor importance.

PURITY AND HIGH QUALITY OF MILK.

The thousands of samples of milk and cream which were analyzed by our chemists during 1906 show that the use of chemical preservatives in dairy products is now a rarity in Pennsylvania. In 1903, the conditions were vastly different, as a very large proportion of the milk and cream samples were found to be illegal, containing formaldehyde, boracic acid, or were skimmed, watered or colored. The crusade for pure and wholesome milk, continued during the entire term of the present Dairy and Food Commissioner, has produced a most salutary effect, as the present reports of our chemists attest in unmistakable terms.

Another feature of the examination into the milk supplies of Pennsylvania that has already been too long neglected, is the sanitary condition of the herds, stables and persons from whom such supplies are received. This is a vastly important question, and it is also to be hoped that provisions for making proper bacteriological tests may be made at an early date. The requisite instruments could be added to the State Chemical Laboratory at Harrisburg at a small cost. It is important to the consumer to know whether the milk coming to his table is produced by healthy and well-fed cows, and whether, bacteriologically, it is clean, dirty or absolutely filthy and dangerous. The additional expense connected with the work, as compared with the value received, would be but trifling, and amply compensate for the acquisition of the much-needed instruments.

NEED FOR CHEESE LEGISLATION.

The cheese law now on the statutes has not been as effective in producing good results as its framers had anticipated. This is due to several causes. Its phraseology is considered as faulty, and its provisions are not in accord with the present requirements.

It is further asserted that neighboring cheese producing districts have better and more efficient cheese regulations. The fact that not a single prosecution under the present cheese law was instituted in Pennsylvania during the year just ending forms its own commentary. The Commissioner is desirous of having enacted a proper and judicious new cheese law, and would not be averse to a repeal of the present law, since it is only cumbering law books and serving no practical purpose. The average quality of cheese is beyond criticism, but it is but proper that consumers should not be taxed extreme prices for skimmed or low grade cheese when paying for the highest grade full cream quality.

LARD LAW MUST BE OBSERVED.

The manipulation of lard at the hands of unscrupulous packers and dealers has again been prolific of many complaints. Consumers will not knowingly buy adulterated or compound lard at the price of pure fat of swine. The compound lard law is still in full force and effect, and if such grade of lard is handled, all concerned must fully comply with its requirements. Pure lard must not contain any foreign material, whatever. The use of stearine, tallow, etc., is prohibited, unless in compound goods, and when properly labeled in compliance with the law. Chemical tests to determine the purity

of the lard sold in Pennsylvania will be made more or less regularly, and it is therefore of special importance that the trade should exercise prudence in buying and selling the article to avoid legal complications.

THE VINEGAR LAW OF PENNSYLVANIA.

The much discussed and imperfectly understood vinegar law of Pennsylvania caused annoyance and discomfiture in many directions. That part of the Act relating to distilled vinegar, prescribing a standard of acetic acid, etc., was confused with that portion referring to fruit or cider vinegar. As a result, fruit-growers and farmers wrote letters to this Division demanding information, and asserting that merchants would not buy their product, except under a guarantee as to acidity and solids, which they could not give, having no means of ascertaining same. The plain facts as to the sale of fruit vinegar demand no hardship on the part of the producer. If the vinegar is the product of the pure fruit juice, and if no water or chemical substances were added or introduced, the farmer and merchant can sell such vinegar with entire freedom and without fear of prosecution. This information should be disseminated in every fruit growing section of the State, as it concerns the financial interests of all those who may be interested in the manufacture and sale of pure fruit vinegar. Copies of the amended law can be had upon application to the Dairy and Food Commissioner.

THE SALE OF RENOVATED BUTTER.

The high prices of butter prevailing throughout 1906 resulted in the sale of an increased amount of renovated butter, and a corresponding increase in the number of applicants for license certificates from prospective dealers who desired to comply with the Pennsylvania statute governing its sale. It is manifest, however, that there are still a considerable number of dealers who will strain their conscience by selling renovated butter for creamery butter, and thereby make an increased profit by such deception. If the Federal and State laws are complied with, the government tax stamp will be found on the original package, while the pound packages will also bear the imprint, "Renovated Butter," thus indicating its true character to the buyer. All food products of whatsoever description should be sold for what they are. It has again been intimated that the "trust" would make a vigorous attack on the renovated butter law at the next session of the Legislature to nullify its more rigid requirements; but it is not at all probable that the dairy interests could be deceived by sophistry, or that they would allow any material change to be made in the law which has been tried and not found wanting. The dairy interests must and will continue to receive protection in Pennsylvania.

THE USE OF CORN-OIL IN OLEOMARGARINE AND LARD.

Maize, or corn oil, as it is better known, is a by-product in the manufacture of starch and glucose. Its physical and chemical properties and constituents are said to be such that it is now being more or less used as an adulterant in lard. Just at this writing, Prof. C. H. LaWall, of Philadelphia, a chemist in the employ of the Dairy and Food Division, reports that he has detected corn oil in oleomar-

garine. He is of the opinion that it was used for the purpose of imparting to oleomargarine a color to make it resemble in appearance the tint of yellow butter. The oleomargarine in which the corn oil was discovered was of a deeper shade of yellow than the common color of the article, although taxed by the government at the minimum rate of one-fourth cent per pound, while regularly colored oleomargarine, whose sale is entirely prohibited in Pennsylvania, is taxed ten cents per pound. Prof. La Wall will make further and more extensive researches into the subject, when the results obtained will be published in detail.

The corn oil industry is of but recent origin, and its possibilities, if used for the several purposes indicated, would certainly be great and far reaching. The oil has a golden yellow color, a pleasant grain-like odor and an agreeable taste.

THE QUESTION OF A MILK STANDARD.

Frequently attention has been called to the alleged so-called "scientific manipulation" of milk on the part of large producers as well as owners of large dairy depots. While certain high grade herds owned by such persons yield milk of exceptional quality and richness, with butter-fat averaging as high as five per cent., the milk is said to receive the aforesaid "scientific treatment" until the fat contents are reduced to three per cent. As Pennsylvania has no fixed standard, and milk from ordinary cows and under common conditions will hardly average much above three and one-half per cent. butter-fat, the "scientific" manipulator regards himself as being within the confines of ordinary requirements of law and safe from prosecution. Under the special process, an additional profit amounting to fifty dollars on a single cow, per year, is not impossible, with the present high prices for milk. It is not unlikely that some means will be devised to prevent this questionable method of profit taking. City and borough ordinances can be enacted to meet this new condition, while State legislation would also be helpful. On this subject the following explanation is pertinent:

"Whole milk generally has a specific gravity at 60° F. between 1.029 and 1.033. Exceptionally rich milk with a high percentage of fat, however, may have a specific gravity lower than 1.029, and by that test alone would be unjustly condemned. Addition of water to milk lowers, and skimming raises, the specific gravity. Low percentages of fat, solids not fat, and total solids, and low specific gravity indicate that the milk has been watered, but when a deficiency of fat and total solids is associated with a normal percentage of solids not fat and a high specific gravity, the milk has probably been skimmed. Samples which have been both skimmed and watered and which are very deficient in fat and solids may have a normal specific gravity, as the two operations have opposite effects on this physical property of milk.

There are then, two reasons why a sample should not be judged by its specific gravity alone: first, exceptionally rich milk might be condemned, and second, milk which has been both skimmed and watered might pass as genuine. Taken in connection with the results of chemical analysis, the determination of specific gravity is, however, of great value."

IMPROVEMENT IN QUALITY OF FRESH MEAT.

The numerous tests and analyses made of samples of Hamburg steak, fresh sausage and fresh meat clearly indicated the usefulness and beneficial results attained through last year's investigation into the use of sulphites and boric compounds as meat preservatives. Besides using sulphurous acid in meat products, as a preservative, it also served as a deodorizer, thereby concealing incipient putrefaction. Although certain practices were sanctioned by the trade and to a limited extent by National and State rulings, the Dairy and Food Division of Pennsylvania could not consistently disregard the law, nor evade the duty which was enjoined by official oath. After numerous prosecutions were brought to a successful termination, a better feeling existed among the trade and consumers were protected and no longer deceived by the imposition of meat which had already become discolored, swarming with bacteria, and, by chemical treatment, restored to its former fresh appearance and sweet odor. The analytical reports show the absence of these deleterious chemicals, and as a result, there are but few prosecutions, as the law is not only strictly interpreted but vigilantly enforced. Where consumers are doubtful as to the quality of the bright, red Hamburg steak displayed by the butcher, it may be advisable to either chop the meat themselves or else have it done by the butcher in your presence.

SALE OF ADULTERATED COD FISH.

During the year ending, a large number of prosecutions were directed to be brought against retail merchants charged with the sale of adulterated shredded cod-fish. The samples represented the output of various firms. Upon analysis, they were found to contain a large percentage of boric acid, thus placing the article under the ban of the pure food law. While a large majority of the dealers believed that they had a legal right to sell such goods, the fines and costs in most instances were paid without recourse to court trials, as it was fully established by expert testimony that the abnormally high percentage of the preservative used rendered the fish positively harmful to health.

The National government has been urged to formulate rules relative to the curing of fish, and prescribing a method whereby a chemical preservative may be used during the warm season. The Commonwealth of Pennsylvania has a special Act of Assembly to govern the sale of fresh meat, fish, game, etc., which expressly forbids the use of chemical preservatives and coal-tar dyes.

DEMAND FOR PURE MAPLE SYRUP AND SUGAR.

An examination of samples of maple syrup revealed the fact that the uncertain mixtures of maple and cane syrups are now being sold for what they are and properly labeled. As a rule, these compound syrups contained less than 50 per cent. of pure maple syrup, while some brands contained a very small amount, indeed.

The maple sugar sold in Pennsylvania was found to be comparatively pure and free from the ordinary sugar which was so freely employed as an adulterant a few years ago. There has been a complete revision in marking and labelling maple syrup and maple su-

gar, and with ordinary care, there is no reason why the consumer should be mislead or deceived. As a result of the enforcement of the law, there is an increased demand for pure maple syrup and the producer of pure goods has a profitable field distinctively his own.

SALE AND USE OF COFFEE SUBSTITUTES.

The constantly fluctuating coffee market has again suggested the use of coffee substitutes. These can be sold without interference, provided they are not sold as coffee, and do not contain any deleterious or illegal material. The branding of such coffee substitutes demands special care to prevent possible trouble. An examination was made into the purity of the cheaper grades of coffee (ground) such as was found on sale in many groceries in package form. While the cheaper grades of the coffee bean were roasted and pulverized, the packages, with hardly an exception, contained nothing foreign to the coffee bean. Of course, the percentage of caffein and tannin was less than that found in the higher grade goods. The suspected admixture of chicory, roasted peas, roasted rye and roasted wheat did not materialize under the microscopic examination in as large a degree as had been anticipated.

NEED FOR REVISED LIST OF PENNSYLVANIA CREAMERIES.

A correct list of the creameries and cheese factories located in Pennsylvania would prove advantageous to the Dairy and Food Division. Such a directory was compiled and printed a number of years ago, but it is of no practical value at this writing, because of the numerous business changes which have taken place since it was issued from the press. It would serve various useful purposes, such as circulating information among dairymen, commercially and otherwise. It is to be hoped that a revised list may be prepared and printed during the coming year.

UNSANITARY ICE CREAM FACTORIES AND PRODUCTS.

The unsanitary condition of certain ice cream factories has attracted the attention of some of the special agents of the Dairy and Food Division. They declare that the legislature should enact stringent laws covering the subject, and that they should be promptly and rigorously enforced. It is also a well known fact that Pennsylvania has no fixed standard for ice cream, and that in consequence a vast amount of stuff is manufactured and sold which is harmful and not worthy of the name ice cream. Leading ice cream manufacturers claim that no ice cream should be sold that contained less than fourteen per cent. butter-fat, while at the present time, a large portion of the so-called "ice cream" is merely a combination of skimmed milk, starch, gelatine and dye stuffs.

The venders of "hokey-pokey" or penny blocks of ice cream also impose upon the public and small children in particular a compound that is not above suspicion. It is probable that this subject will receive careful attention next summer, even though no additional legislation may be enacted. It is self-apparent that there is room for improvement along this particular line. As usual, the legitimate manufacturer is in hearty sympathy with the proposed moment to secure a better and higher grade of cream. The general sanitary conditions and equipments where such cheap ice cream

substitutes are made, together with its too often unwholesome ingredients, demand special action.

PUBLIC FAVOR PURE FOOD LAWS.

While the progress in enforcing food laws may at certain periods appear unsatisfactory and disappointing, the fact is indisputable that the present is the most interesting as well as most important in the history of food legislation, notwithstanding prevailing impressions in some quarters to the effect that the pure food question has been practically settled. The active operation of laws in numerous states, the organization of departments for the enforcement of measures recently passed, and the enactment of a National food and drug act, all combined, strongly indicate the trend of public sentiment. The pioneer work performed in Pennsylvania has not been done in vain. Other states are following, and although new and knotty problems arise and confront us almost daily, the pathway has been cleared for renewed activity.

SELLING FILTHY AND UNWHOLESOME FOOD.

The Dairy and Food Commissioner is of the opinion that increased attention should be given to the question of more strict sanitation of groceries, bake shops, meat markets, truck stands, confectionery stores and all other places where food products are manufactured or sold. The state of affairs observed at many such places visited is deplorable and bodes no good for the public health. While primarily engaged in enforcing the pure food laws, these evils are self-evident and should not be overlooked much longer. One source of contamination are the unclean refrigerators. Exposing all kinds of articles of food to the air, sun, dust and the attack of insects is another evil of serious effect and importance. A visit to many of the shops and stores located in the tenement and manufacturing districts of Philadelphia, Pittsburg and other cities will forcibly and amply prove the truth of these unpleasant but truthful statements.

IMPROVED STANDARD FOR CONFECTIONERY.

The long existing and well founded prejudice against the use of harmful ingredients in the manufacture of candy bore fruit, with the result that hundreds of dealers in impure confectionery were arrested and fined. These candies were found to contain sulphites, coal-tar pigments, minerals, talc and other positively harmful substances. The wholesale number of suits brought had an excellent effect, and the candy trade has been revolutionized. Reputable manufacturers know full well that an increased consumption of a product depends more upon the quality and wholesomeness and purity of that product than anything else, consequently they heartily favored the enforcement of the law. The Dairy and Food Division was especially gratified with the aid and counsel received through a certain portion of the trade. The time was ripe for action and much genuine good was accomplished.

One candy firm at great expense is having all its colors tested for arsenic and if even the minutest trace is present, they will not use it. Others are equally scrupulous regarding the use of glucose containing sulphites, and consequently we have pure and better goods.

FICTITIOUS FIRM NAMES AND ADDRESSES.

While not a common practice, it has become evident that there were food products placed upon the market which bore fictitious names and addresses of so-called manufacturers. This caused confusion and loss in several cases where the goods sold under such misleading labels were found to be illegal, and their real origin could not be traced. The National law prohibits such misbranding, and some means should be devised to stop the practice that prevails in this State. The question would not be of such importance if the goods covered by the fictitious labels complied with the law. An overwhelming majority of the manufacturers, jobbers and dealers are determined not to handle such goods, and discountenance their sale in every practicable manner.

PURE WATER ESSENTIAL ON DAIRY FARMS.

As the health of the public largely depends upon cleanliness, and one of the most serious dangers is contamination of the water supply, the dairy farm is always subject to special danger because of a crude or imperfect sewage system. If the water supply on a dairy farm is contaminated, it is utterly impossible to produce sanitary milk, since utensils washed in impure water will directly affect the milk. Such infected milk will produce bowel disturbances, typhoid fever and dysentery, while the real cause may not be suspected. As the health of the people, whether in the city, town or country, depends so greatly upon the purity and cleanliness of the milk supply, the legislature would act wisely if needed laws to cover a proper inspection of barns, herds and utensils were formulated and enacted. The enormous mortality of infants below the age of one year forms its own commentary. This, in a large degree, is due to the substitution of artificial, or bottle feeding in place of the natural process of rearing and feeding babes. Were the milk pure and properly treated, the artificial feeding would not be subject to such strong condemnation, based upon careful experiments.

BAKING POWDER.

Many correspondents have applied for information regarding the legality of baking powders, their various kinds, comparative values, etc. Their status may perhaps be best defined by the statement that no kind of baking powder is deemed adulterated under our food law, providing no deleterious ingredients are used in its manufacture, and no deception is practiced. While we have no special law governing the manufacture and sale of baking powder, it might be well to bear in mind that although a wide latitude of nomenclature has been permitted, it would be wise not to misbrand nor misrepresent such goods to the financial harm or detriment of the purchaser and consumer.

ANALYZING FLOUR FOR INFORMATION.

Housekeepers and others have at various times asked for analyses of samples of flour. Under the rules of the Dairy and Food Division, such requests could not be granted, since no fund to pay the

costs of such examinations was available. Where mixtures of two kinds of flour, such as rye with wheat flour are sold, it seems that the flour should be labeled accordingly, in order that the purchaser would not be deceived.

An Act of Assembly to regulate the manufacture and sale of commercial feeding stuffs is now in force, and has saved thousands of dollars for the farmers and dairymen of Pennsylvania. It is being enforced under the direction and vigilant care of the Secretary of Agriculture, from whom full details are obtainable. The Dairy and Food Division has no jurisdiction over the aforesaid class of products, and all correspondence upon the subject is promptly referred to the Department of Agriculture for attention.

BENEFITS OF THE "MONTHLY BULLETIN."

The publication of the Monthly Bulletin, issued by the Dairy and Food Division has been the means of calling attention to a large variety of adulterated articles of food. It serves numerous other purposes, among which is the fact that it cautions dealers to leave illegal goods alone, and to demand only pure food products. The public are thus educated, violators of the pure food laws are punished and food adulteration decreased in a corresponding degree. This method of publicity has proven most satisfactory and afforded valuable assistance and information to the thousands of readers of the Bulletin. The list of persons receiving the Bulletin is constantly being enlarged and practically includes all the leading firms interested in food products. Its scope and usefulness will be still further enlarged in the near future.

ADULTERATED MILK AT MILITARY ENCAMPMENTS.

Sutlers, commissaries and others at the several annual military encampments of the National Guard of Pennsylvania, held at Gettysburg and other points, were boastful of the long-keeping property and excellent quality of the milk and cream which they purchased from local milkmen and supplied to the soldiers, as a part of their regular dietary. An official visit by special agents of the Dairy and Food Division and the purchase of samples of milk and cream followed, with the result that the chemists pronounced many samples as being heavily "doped" with formaldehyde, a dangerous procedure, since a number of officers and privates were made ill through the continued use of such drugged milk during the term of the encampment. Arrests followed, and in some cases the defendants appealed to court, with the result that they were convicted and heavy fines and costs imposed by the judges. This work received the highest commendation.

DIMINISHED NUMBER OF VIOLATIONS AND SUITS.

The Dairy and Food Division has closely adhered to the active policy inaugurated three years ago, and the number of prosecutions brought during the year was only diminished because of the higher percentage of purity found in the thousands of samples analyzed by the chemists of the Division. Another method of procedure was to continue and encourage the educational campaign introduced at the commencement of the administration. Manufacturers and jobbers were made acquainted with the requirements of the law, in the hope that they would willingly cooperate with the officials by placing on

the shelves of the retail merchants only merchandise that fulfilled the demands of law in both quality and labeling. While not as generally accepted as might have been expected, the plan was beneficial and materially helped to decrease the extent to which food adulteration had formerly prevailed. The principal intentional violators of the pure food law would not cooperate, and as a result, some of their patrons were punished accordingly for selling illegal goods. Some interesting facts might be incorporated into this paragraph in connection with the experience of several firms who ignored their plain duty towards patrons and the public.

NO JURISDICTION OVER ADULTERATED LIQUOR.

As the Supreme Court of Pennsylvania decreed that the Dairy and Food Commissioner had no legal jurisdiction over the sale of adulterated whiskey, brandy, wine, beer and other intoxicating liquor, the examination of such articles of drink was necessarily discontinued, notwithstanding the wholesale doping and drugging which was found to be such a common practice. So-called "artificial whiskey," "imitation fruit brandy," and compounds and combinations of all kinds, are now being sold fearlessly and regardless of physical results.

The special constituents of compound liquors unknown to the ordinary drinker, as well as neutral spirits, prune juice, bead oil, old sherry heading, artificial fruit essences, etc., now have a larger sale than ever before. Artificial whiskey may have a legal status under the United States laws, but it should be sold under its true name, which is equally true of all articles of drink which do not comply strictly with the requirements laid down in the United States Pharmacopoeia, which demand that goods shall be strictly pure and free from added constituents or coloring matter. Goods not conforming should certainly be branded "Artificial Whiskey," "Artificial Brandy," etc., as the case may require, regardless of the fact that no State law is operative at the present time. It is confidently believed that the next Legislature will be willing to pass much needed laws to remedy the present unsatisfactory state of affairs. The reputable producer, whether distiller or brewer, has no uncertain mind as to the need for a thorough regeneration of the liquor traffic, so far as purity and quality is concerned. Another conspicuous feature is the extremely wide range of the alcoholic contents found in commercial "whiskey," ranging from 25 to 54 per cent. Comment is unnecessary. The work of the past in this State in suppressing the sale of adulterated liquor was fully justified.

TESTING CONSTITUTIONALITY OF OFFICE OF DAIRY AND FOOD COMMISSIONER.

The Dairy and Food Commissioner of Pennsylvania is again being subjected to considerable expense for extra legal services, and the work of the office and the special agents seriously hampered by a writ of quo warranto, issued by certain parties, first, to test the constitutionality of the office, and, second, to determine the constitutionality of the powers of inspection which the petitioners alleged the respondent was exercising in the purchase and examination of food products, in order that adulterations might be detected, the public protected, and the violators of law punished and

restrained. The Commissioner, while never entertaining any doubt as to the validity of defendant's title to the aforesaid office, is also deeply anxious for a judicial interpretation of the question, and it is believed that the Supreme Court of the Commonwealth will render a decree at an early day. It is admitted that the Commissioner, acting upon the advice and opinions expressed in sworn special agents' reports and analytical reports, authorized the bringing of prosecutions and instructed these agents and the attorneys to institute criminal proceedings under various statutes, against retail grocers, wholesale grocers and manufacturers, and that such parties were mulcted in fines and costs, but, it is further claimed that all such acts were performed within the legal rights and original meaning of the Acts under which he received his appointment, and that such rights and duties were performed without fear or favor and for the public good, and for the protection of health.

NEW NATIONAL FOOD AND DRUG LAW.

The enactment of the National Food and Drug Act attracted widespread attention. Hundreds of correspondents wrote to the Dairy and Food Commissioner of Pennsylvania for copies of the aforesaid statute, while others submitted labels, etc., to ascertain their legality. The manufacturers of certain medicines, etc., were especially active in their quest for information, but as the Pennsylvania food authorities had no control or jurisdiction over such goods, the letters were promptly referred to the National Department or to the State Pharmaceutical Board for consideration and reply.

Many reports published in recent years referred to the quality of commercial drugs and drug products. While an investigation made by the Dairy and Food Division proved the frequency of drug adulteration and substitution, it was also revealed that there was a marked variance in the quality of drugs sold or prescribed, even though unadulterated. This condition is susceptible to many dangers to human life, and wherever possible the strength of the active ingredients should always be ascertained whenever possible or practicable. The singular and varying physiological actions of chemicals and drugs in the human economy can frequently be traced to these variations in quality, hence the special importance of the subject. As already stated, the Dairy and Food Division has no legal jurisdiction over these matters, but as in all other questions of common interest, will afford such information and assistance as may be practicable. The importance of using only pure drugs is obvious.

DECREASED SALES OF OLEOMARGARINE.

The magnitude of the oleomargarine industry in the United States is clearly shown in the following statistics published by the United States Commissioner of Internal Revenue:

OLEOMARGARINE PRODUCTION 1888-1906.

1888	34,325,527
1889	35,664,026
1890	32,324,032
1891	44,392,409

1892	48,364,155
1893	67,224,298
1894	69,622,246
1895	56,958,105
1896	50,853,234
1897	45,531,207
1898	57,516,136
1899	83,130,474
1900	107,045,028
1901	104,943,856
1902	126,316,436
1903	71,804,102
1904	48,071,480
1905	49,880,982
1906	53,146,659
<hr/>	
Total	1,208,627,919

DEFECTIVE FEDERAL OLEOMARGARINE LAW.

The federal statute relating to the manufacture and sale of oleomargarine is so framed that in order to secure a conviction, it must be proven that such violation was committed "knowingly." This word must be eliminated from the statute in order to make it fully effective, and all interested in dairying and agriculture have a joint and mutual interest in demanding of Congress a proper modification of the law. The Pennsylvania dairymen are already effectively organized for this purpose, and will wage a strong fight. The State Dairy Bureau of California also objects to the federal oleomargarine statute in addition of the objections urged by Pennsylvania officials, in the following trite language:

"A further feature in which the Federal law has proven somewhat disappointing as a protection for butter against oleomargarine is the attitude of the Internal Revenue Department of the United States on the question. Although plainly enacted with a view of suppressing the sale of oleomargarine in imitation of butter, the revenue officials seem to view it as a "revenue" measure primarily, and only incidentally as a protection against fraud. Hence, it seems that they do not wish to interfere in a manner that will prevent the traffic in oleomargarine, lest this source of revenue for the Government be restricted.

In view of these facts, which have received much attention at the hands of the dairy commissioners of the different states, it would be dangerous to the dairy interests of a State that has imitation butter (oleomargarine) under control to relax its hold on the situation."

Pennsylvania has taken the initiative, and will not recede from her demands for the equitable and proper revision of National legislation.

ARTIFICIAL COLORING AND THICKENING OF MILK AND CREAM.

Although in former years, many samples of milk and cream, when analyzed, were found to be artificially colored or thickened, such instances of deception and fraud are now comparatively rare in this State. The imposition of a heavy fine and costs upon the offenders

speedily overcame this abuse. The problem received special attention, and the Dairy and Food Division looks upon this achievement with considerable pride. The too common plan of using a "thickener" in low grade cream and a coloring material to make it look rich and better than it really was, is no longer a feature of every day dairy practice. The keen competition of rival creamery proprietors may be responsible for some trade evils, but "cream thickeners" and "artificial coloring" was more than they could support, except at a heavy loss.

ANALYTICAL WORK OF THE DIVISION.

The chemical laboratory work of the Dairy and Food Division has assumed large proportions, as the analytical reports published in the Monthly Bulletin will attest. The equipment of the laboratory at Harrisburg is first-class, being supplied with entirely new and modern paraphernalia. A detailed report of the operations of the Harrisburg, West Chester, Pittsburg and Erie laboratories would make interesting reading. A large amount of experimental work was also performed. The results will be published by the National Department of Agriculture and in the State publications. In view of the great interest in the use of coal-tar colors and chemical preservatives, these investigations will attract wide attention. The Pennsylvania chemists will therefore be of great practical service to the Nation and State, and to the consumers, generally.

THE STEWARDS OF PENNSYLVANIA.

The International Stewards' Association has rendered noble service in promulgating the pure food doctrine, not only through the medium of its official publication but also in practice. The Pennsylvania and Philadelphia branch of the association are among the strongest and staunchest supporters of pure food legislation. Their efforts are worthy of commendation. It is but proper to add that the leading hotel stewards of the State and Nation recognize Pennsylvania's attitude in the enforcement of the laws that assure a better and more healthful food supply. They realize the responsibility of their positions in feeding the masses, and the Dairy and Food Division hereby offers this grateful tribute for their devotion to a cause that possesses such high merit.

TESTING FOR BUTTER SUBSTITUTES.

Letters from housewives have reached this Division, asking for a simple test by which adulterations or substitutes in butter could readily be detected. The violations of law relative to butter usually consist of the substitution of renovated butter and oleomargarine or butterine for the genuine article, or the sale of butter containing an excessive amount of water. To distinguish the three articles named, follow these directions carefully:

"A small portion of the butter (size of a hazlenut) is placed in an ordinary table spoon and heated over a low flame (alcohol lamp, etc.) to the boiling point, stirring constantly with a toothpick or some

similar article. Genuine butter boils quietly and produces an abundance of foam; renovated butter sputters like grease and water when boiled, and produces but little foam; oleomargarine acts very much like renovated butter, boiling with considerable noise and producing practically no foam. The characteristic odor of tallow also becomes evident when the sample in question is oleomargarine. Butter should not contain an excess of water, which is sometimes purposely incorporated. This may be known by the water oozing out abundantly upon the surface of the butter when cut."

Another test that can be used in determining oleomargarine is the following:

The "Scientific American" recommends this simple test for oleomargarine: Stir a small quantity, half a teaspoonful or less, of the suspected butter into enough sulphuric ether to dissolve it. By the time the grease is dissolved the ether will have been evaporated, and the residuum will show to smell or taste whether it is butter, lard or tallow. Five cents worth of ether will suffice for several tests.

CANNING ESTABLISHMENTS IN PENNSYLVANIA.

The Dairy and Food Division has been called upon at various times to offer advice and suggestions in connection with the organization and location of canning establishments. These plants in many instances were erected by local capitalists mainly because of the rosy promises and prospects which were presented by those directly interested in the sale of the necessary machinery and other material requisite to furnishing such plant. They had comparatively small risks, since the joint responsibility of the farmers and others constituting such canning companies was more than ample to secure them against loss. The innovation was a comparatively new one in Eastern Pennsylvania, and it is feared that disappointment and consequent financial loss will also follow some of these investments. It is already evident that the profit lies in canning immense quantities of goods, and that the quality and reputation of the goods placed upon the market by a canning company are a most potent factor in the question of profit and loss. Competition between producers in the sale of low-grade goods is not conducive to prosperity and success, as some of these investors have already realized.

RENEWED ACTIVITY IN SALE OF ADULTERATED LIQUOR.

Although thousands of persons are being poisoned daily by chemical whiskey, wines and liquors served to them as the alleged product of some famous distilleries, it is not within the power of the Dairy and Food Commissioner to institute legal proceedings against such offenders and evil doers. There is a startling increase in the number of cases of alcoholic poisoning, and notwithstanding the complaints received at this office, there is nothing that can be done at this writing that will alleviate the unfortunate situation. It is a matter of further regret that the investigations made into the prevailing conditions proved that not only the cheaper places sold poisonous and chemically prepared or manufactured drinks, but that many of the so-called "first" places were equally guilty.

PRAISEWORTHY ANALAYTICAL RESULTS.

While the analytical work performed during the past year exceeded in volume and importance that of any previous year in the history of the Dairy and Food Division, as the reports of analyses published in the Monthly Bulletin clearly demonstrate, there were no complaints of errors or inaccuracies, and the Commissioner therefore takes especial pleasure in commending the several chemists for their continued painstaking and watchful efforts to prevent an injustice being done. The new chemical laboratory established in this city by the Commonwealth is equipped with a complete and modern outfit, and the work assigned to it has again largely increased. The experimental work was necessarily confined to a limited sphere because of the press of general work, but proved valuable and helpful.

DANGER IN PROPOSED NEW FOOD LEGISLATION.

The pure food law of June 26, 1895, when intelligently and reasonably enforced, cannot possibly be supplanted by any legislation that would afford better nor greater protection to public health and the consumer in particular. It is apparent that certain interests will demand changes and possibly a new pure food law, so as to more effectively and completely meet the requirements of the new National food and drug statute. The Dairy and Food Commissioner has at all times endeavored to perform his duties with fairness and impartiality, and it would be indeed regrettable if certain proposed changes should seriously harass the present good work, and perhaps nullify the excellent results of the past.

PRESERVATIVES AND DYES IN FOOD.

Hundreds of inquiries were received, relative to the use of chemical preservatives and coal-tar dyes, etc., in food products. The use of benzoate of soda as a preservative is especially common and the fact is known to nearly every intelligent housekeeper. Although no definite official sanction has been promulgated by the Commissioner for such action, the preservative continues to be used, but usually in quantities not exceeding one-tenth of one per cent., and its presence is stated on the label. The harmfulness of the preservative in question, when used in small amounts, is the subject of an extensive research on the part of the Federal authorities, and until their official report is made public, the National and many State governments permitted its use tentatively, if not definitely. Curious and singular as it may appear, some of the largest producers of food products have abandoned its use, while leading druggists also declared that there was no longer a real necessity for its use in food products.

INTERNATIONAL STEWARD'S ASSOCIATION.

The International Stewards' Association has continued an active campaign for pure food and liquor, notwithstanding that the steward or chef ordinarily could make a larger margin of profit, at the expense of the stomachs of their guests, by purchasing adulterated or inferior goods. It is most gratifying to state that in the case of hotels and restaurants especially, there is less adulterated food used today than has been at any period in the past. The association in

a large degree, has brought about this much desired change for the better, and the Commissioner is pleased to render this tribute to their helpfulness and commendable work. The Stewards' Association has strongly favored the passage of pure food laws, and now insist upon such guarantees and regulations as will enable them to get better food products of all kinds for their tables.

IMPROVEMENT IN QUALITY OF FOOD STUFFS.

With the continued vigorous enforcement of the pure food laws of Pennsylvania, there has again been a marked improvement in the quality of nearly all food commodities sold in this State. This statement is fully corroborated by the published analytical reports of the Dairy and Food Division, which form a sharp and decided contrast with the conditions that prevailed only a few years ago. Manufacturers, packers and producers of all kinds realize that it pays to obey the law, and that the market for the stuff which bears on the label the tale of adulteration is no longer a profitable one. To-day, manufacturers of food products whose products were shown by chemical analysis to contain poisons and deleterious substances have either eliminated the objectionable stuff from their wares, or have placed the names and the quantities of the adulterants on the face of the package so that all may buy knowingly. Many other delinquent manufacturers have withdrawn their goods from the Pennsylvania markets.

DANGEROUS ADULTERATION OF FLOUR.

The high price of flour has led to a new adulterant which has been detected in the Ohio markets by the State authorities. It is made of white clay pulverized and is called mineraline. Because of the fact that it is indigestible, it is a very unwholesome adulterant. It costs about one cent a pound, and as flour sells at three cents a pound, a small proportion of mineraline mixed with the flour makes it quite profitable. It can easily be detected under a microscope. Commissioner Blackburn, of Ohio, who investigated the matter, wrote as follows to the trade who desired information:

"A chemical analysis shows that it is a siliceous mineral resembling talc in physical properties. It is insoluble even in the strongest sulphuric acid, and is totally unfit for the purpose for which it is made. It seems to be a kind of clay, dried and powdered very fine, and is shipped from Greensboro, N. C. You are hereby notified to be on the lookout for flour adulterated with this substance, take samples and leave them with the nearest chemist for analysis. The smallest per cent. of adulteration with this substance can be easily detected under a microscope."

The Pennsylvania authorities have not found any such adulterated flour on sale.

BOGUS DAIRY AND FOOD AGENTS.

No one ordinarily has any conception of the many obstacles that must necessarily be overcome in a campaign for pure dairy and food products, but one of the most unpleasant and annoying facts is the occasional appearance of a bogus "special agent" of the Dairy and Food Division. In one instance at least, the guilty party was promptly arrested and subjected to a term of imprisonment. All

parties concerned can readily satisfy themselves upon demanding to see the credential carried by the duly authorized and sworn representatives of the Department of Agriculture, which must in all cases bear the signatures of the Secretary of Agriculture and Dairy and Food Commissioner, respectively. Where such certificate cannot be produced, the Department should be notified by wire without delay, and the imposter held for further examination. The special agents of the Dairy and Food Division are amply able to establish their authority to act, and it is hoped they may be accorded proper courtesy while engaged in the performance of duty.

OLEOMARGARINE AND RENOVATED BUTTER LICENSES.

The following statement will show the number of oleomargarine and renovated butter license certificates issued during the year ending December 31, 1906:

Oleomargarine	267
Renovated butter	20

CLASSIFICATION OF LICENSES ISSUED.

Oleomargarine Licenses.

Wholesale	9
Retail dealers	248
Restaurants	5
Boarding houses	5
Total,	267

Renovated Butter Licenses.

Wholesale	2
Retail dealers,	17
Boarding houses	1
Total,	20

The aggregate amounts received and paid into the State Treasury for the use of the Commonwealth, was as follows:

Oleomargarine licenses,	\$23,819.36
Renovated butter licenses,	2,466.68
Total,	\$26,286.04

In conformity with previous customs, the appended financial statements are respectfully submitted:

FINANCIAL STATEMENTS, 1901 TO 1906, INCLUSIVE.

	1901.	1902.	1903.	1904.	1905.	1906.
Pure food fines,	\$4,833 23	\$8,082 20	\$39,752 18	\$52,904 05	\$33,414 46	\$37,414 09
Oleomargarine license fees, act 1899,	20,516 74					
Milk fines, act 1901,	225 00	1,177 24	6,093 56	1,685 00	1,972 68	1,298 63
Oleomargarine license fees, act 1901,	1,089 26	23,427 65	37,911 18	31,277 61	26,823 23	23,819 33
Oleomargarine fines, act 1899,	5,446 97	3,238 18	616 20	85 00		
Oleomargarine fines, act 1901,	2,070 87	5,225 75	5,977 28	2,698 22	10,899 98	13,145 27
Oleomargarine fines, act 1903,			125 00	100 00		
Renovated butter fines, act 1899,	129 00	5 50	17 50			
Renovated butter fines, act 1901,		572 68	1,632 05	2,321 56	1,333 14	932 00
Renovated butter licenses,		766 67	266 67	4,042 09	4,800 03	2,466 63
Cheese fines,	105 00	169 50				
Vinegar fines,	73 12	447 24	779 24			
Lard fines,		23 00	357 00			
Preservative fines, act 1903,				669 76		
Meat fines, act 1905,					2,113 08	390 82
Fruit syrup fines, act 1905,						60 00
Sale of old furniture,						14 00
	\$34,705 19	\$43,635 41	\$93,458 71	\$96,183 23	\$82,407 60	\$79,590 35

These comparative statements covering a period of six years show at a glance that there is no State in the Union that has more rigidly and effectively sought to enforce dairy and food laws than the Commonwealth of Pennsylvania. It can be said with equal truth that the food adulterator has a higher regard for the wholesome laws of this State than ever before, and that in very many instances he has unwillingly abandoned our markets and concentrated his efforts to sell his goods in other States.

PROSECUTIONS DURING 1906.

As was confidently expected, there was another decrease in impure, adulterated and deleterious food products found on sale in this State in 1906. As a result of these gratifying results, our several chemists recommended a largely diminished number of cases for prosecution. These reports were more than pleasing to the officers of the Dairy and Food Division as they again demonstrated the effectiveness and success of past campaigns for pure and better food supplies for Pennsylvania. The appended figures are self explanatory, and need no special comment. The total number of prosecutions ordered during the past four years for violations of the dairy and food laws of Pennsylvania for the respective years, were as follows:

1903	1800
1904	1517
1905	1085
1906	1050

Total,	5452
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Should any material change be made in the laws now regulating the manufacture, sale and production of food and dairy products, it is more than likely that such legislation will be framed to protect the retail merchants and small dealers, even if it is done at the expense of the consumers.

MISREPRESENTING FOOD OFFICIALS.

Unscrupulous manufacturers have at different times promulgated claims to the effect that the United States Government authorities as well as the Pennsylvania Dairy and Food officials had officially endorsed and guaranteed the purity of their goods. Reference to this subject was made in previous reports, and the Commissioner therefore can only reiterate the statement that no such authority was given or implied in Pennsylvania. The manufacturer may make and offer for sale pure goods, and individually, he is perfectly privileged to present such a guarantee; but, he cannot authoritatively assert that the Dairy and Food Commissioner has endorsed the purity and wholesomeness of such article. The analytical reports which appear in the Monthly Bulletin are open to public inspection and form their own comments, but beyond the publication of such reports, the Dairy and Food Division neither courts nor claims responsibility. Such improper advertising is to say the least of doubtful propriety, if not entirely indefensible. The Commonwealth of Pennsylvania, reports to the contrary notwithstanding, does not guarantee any article of food.

A DEMAND FOR BETTER BREAD.

With the increase of scientific knowledge amongst the people generally, comes a demand for the better sanitary surroundings in all food producing establishments. Letters complaining about unsanitary bake-shops, etc., were not infrequent. Others alleged that they were deceived through the purchase of "mixed flour;" others again claimed that employes with malignant ulcers and sores worked in bakeries, while still others protested against the employment of tuberculous people in bakeries. According to experiments made in Paris, the latter protest was well-founded. The report reads as follows: "The experimenter was struck with the idea that, taking into consideration the physical conditions of many bakers, it might be possible that infectious diseases should be transmitted in that way. He introduced into some dough balls some *Bacillus tuberculosis*. The dough was baked in the ordinary fashion and the bread fed to pigs. They died, and on being examined it was found that death was due to tuberculosis. These facts and theories are not new, and the only bearing they have at present is to accentuate the position which is taken now, by sensible scientists and by intelligent tradesmen, of the necessity of producing bread under as good and cleanly conditions as are possible."

UNFOUNDED COMPLAINTS AS TO FOOD PRODUCTS.

What may be regarded variableness of formulas for making various food products frequently misleads the consumer as to quality and healthfulness, and as a result, a letter of complaint is filed with the Dairy and Food Commissioner. If such article is sold for what it is, and does not contain any illegal constituent, the rights of the purveyor cannot be questioned. Of course, unsanitary conditions should not be tolerated, neither should the public be deceived as to the quality and merit of an article of food. A "trick" or an imposition invariably yields trouble for the manufacturer and dealer, but wherever practicable, full justice will be done to all concerned.

CO-OPERATION OF PURE FOOD OFFICIALS.

The arduous work of the year now ending has again impressed the great necessity for a better and more effective plan to cooperate with the National and State governments in enforcing food laws. The mutual aid that could thus be easily bestowed would prove most helpful, bring these various officials into a more intimate and closer business and social relationship, and also dispel some of the petty jealousies that should never exist in official circles. We want better conditions, and the attitude of the Pennsylvania authorities will be strictly for that line of cooperation which will produce the greatest amount of good for the greatest number.

FEDERAL VERSUS STATE FOOD LAWS.

With the enactment of a National Food and Drug Act, there were many people who believed that such a measure would supplant State laws. This, however, is a mistaken idea, and while the Federal law should have a strong tendency to check adulteration, in certain kinds, namely, on goods shipped into the State from other States, it cannot and does not prevent adulterations of goods intended for home consumption. Strict State laws and their proper and vigorous enforcement are therefore as desirable and necessary as before the enactment of the Federal law. The Federal law naturally is an object of special interest at present, and the interested cannot do better than to make a careful and extended study of both the National and State laws.

GRATEFUL ACKNOWLEDGMENT.

The most cordial thanks are hereby extended to His Excellency, Governor Pennypacker, and to Hon. N. B. Critchfield, Secretary of Agriculture, for their much appreciated support and advice in connection with the performance of the arduous and intricate duties that devolved upon the Dairy and Food Commissioner. The press of Pennsylvania again demonstrated its willingness to champion the cause of pure food and drink, and is entitled to special praise. The agricultural organizations, grangers, grocers and clergy, and the faithful attaches of the Dairy and Food Division, whether employed in the office, field or chemical laboratories, are also entitled to a full measure of gratitude and praise for duties conscientiously and well-performed. Without such hearty support and intelligent aid received, the success achieved would not have been possible.

Very respectfully,

B. H. Warren.

Dairy and Food Commissioner.

REPORT OF THE STATE VETERINARIAN FOR 1906.

HARRISBURG, PA., *January 1, 1907.*

Honorable N. B. Critchfield, *Secretary of Agriculture, Harrisburg, Pa.:*

Sir: I have the honor to submit the following report on the work of the office of the State Veterinarian and upon the work of the State Livestock Sanitary Board for the year 1906.

In order that the distinction between the work of office of the State Veterinarian and the work of the State Livestock Sanitary Board may be clear, I will refer briefly to the history of these offices. The office of the State Veterinarian is established by authority of the Act approved March 13th, 1895, entitled "An act to establish a Department of Agriculture and to define its duties." The same act places certain responsibilities upon the Department of Agriculture with regard to distributing information upon the raising and care of livestock and the supervision of the health of animals. The same legislature enacted a law entitled "An act to establish the State Livestock Sanitary Board, and to provide for the control and suppression of dangerous, contagious or infectious diseases of domestic animals." This act was approved by the Governor May 21, 1895, that is, more than two months subsequent to the approval of the act organizing the Department of Agriculture. The State Livestock Sanitary Board, as established under the second act referred to, is composed of the Governor of the Commonwealth, the Secretary of Agriculture, the Dairy and Food Commissioner and the State Veterinarian. This Board is authorized to protect the health of the domestic animals of the State and to determine and employ the most efficient and practical means for the prevention, suppression, control or eradication of dangerous, contagious or infectious diseases among domestic animals. For these purposes, the Board is clothed with certain powers in relation to establishing and maintaining quarantines, the disinfection of certain localities and articles and the destruction of animals, as it may deem necessary. It is also clothed with additional powers and duties under later Acts of Assembly.

The distinction, then, between the office of the State Veterinarian and the State Livestock Sanitary Board is that the general subjects in relation to the health of animals that concern individual owners and that touch upon the general welfare of animals and animal husbandry, fall under the act organizing the Department of Agriculture, and are assigned by the Secretary of Agriculture to the State Veterinarian. On the other hand, the control of dangerous, contagious or infectious diseases of animals—the diseases that spread and that are of importance to a community and to farmers whose animals are as yet unaffected—fall under the jurisdiction of the State Livestock Sanitary Board. In other words, the State Veter-

inarian has certain duties as an officer of the Department of Agriculture in assisting in the development of animal husbandry, and he has other duties as a member of the State Livestock Sanitary Board in regard to the suppression of infectious diseases and in the performance of other duties specifically prescribed by law.

It is difficult, in some cases, to define the line of demarcation between these two classes of duties, and no effort has been made on my part to separate them. The duties of the State Veterinarian as an officer of the Department of Agriculture and as a member of the State Livestock Sanitary Board have been attended to as they have arisen in the day's work, with no effort to classify the task.

My only reason for referring to these subjects at this time is that the work that falls to me in these two capacities has increased so very much during the last few years that it is no longer possible to conduct it without considerable additional help. If such assistance is to be asked for, the question will at once arise as to whether it should apply to the Department of Agriculture or to the State Livestock Sanitary Board. My idea is that the increase should be in the office of the State Veterinarian, that is to say, in the Department of Agriculture. The reason for this recommendation is that the State Livestock Sanitary Board is already authorized by law "to appoint and employ such assistants and agents" as may be necessary in carrying out the provisions of the law under which the Board is established. That is, the scope of authority of the State Livestock Sanitary Board in this direction is similar to the authority of the Department of Health as to the appointment and employment of such persons as it may be necessary to appoint and employ to carry out the mandates of the law. I suggest that the legislature be asked for authority to employ a clerk and a stenographer for the office of the State Veterinarian. Each head of a division in the Department, except the State Veterinarian, already has such assistance. Technical assistants, inspectors, etc., are now employed as required by the State Livestock Sanitary Board. There is need, however, for additional help in the administration of the large volume of work that comes to my office.

As to the growth of the work that is now conducted: The correspondence of the office has doubled in less than four years. The livestock owners, veterinarians and sanitarians are using the facilities of the office and of the laboratory more freely than ever before. The office is called upon for advice with regard to problems in all branches of animal husbandry, dairying and the veterinary sciences. Most of these communications can be answered from the office, some, however, are referred to appropriate experts.

The principal work, as heretofore, has consisted in the control of infectious diseases, which are reported upon separately below. It will be observed that there has been a considerable increase in the amount of work that has been required in relation to rabies and glanders. The distribution of these diseases is such that they may occur in any part of the State, at any time, so that constant watchfulness must be maintained.

According to the last estimate of the United States Department of Agriculture, the number and value of the domestic animals on the farms of Pennsylvania is as follows:

	Number.	Value.
Horses,	607,010	\$66,127,689
Mules,	30,864	5,024,210
Milch cows,	1,141,494	41,093,784
Other cattle,	984,750	17,478,308
Sheep,	1,102,058	5,353,799
Swine,	589,685	9,303,039

The above table does not include animals not on farms, nor does it include poultry. According to the census of 1900, there were 242,465 horses and mules in cities and towns which, at present prices, are worth \$26,739,625.

The value of the poultry in the State is estimated at \$5,000,000; this makes a total valuation of livestock of approximately \$175,000,000. This industry is the main stay of a large proportion of the 224,000 farms of Pennsylvania. To a very large extent, the crops raised on these farms are fed to animals and are marketed as animals or animal products, the chief of which is milk. The importance of our animal husbandry is, therefore, very great both to the rural people and to the inhabitants of cities who depend so largely upon the products of the animals of the state for food. Animal husbandry, very properly, ranks as one of the leading industries of Pennsylvania. In connection with such an industry there are many important problems, the solution of which is of large significance to those engaged in it. Many of these problems relate to the health of animals and fall within the domain of comparative pathology. Others relate to the production and development of animals. All of these problems, in many of their relations, at least, may properly be classed among the veterinary sciences. It is, therefore, apparent that there is a large field for the veterinary work of the State, and that all that is now done in this direction is not only amply justified by the magnitude of the industry, and its problems, but that far more might be done without danger that this work will become out of proportion to the industry that it is to foster. When one considers the enormous losses, amounting to five or six million dollars a year, that result from the neglect of preventible causes of diseases of animals, it is clear that it is the duty of the State to develop its facilities for preventing this enormous and unnecessary annual depletion of its capital. This can be accomplished by providing increased facilities for veterinary work, including the veterinary work of the Department of Agriculture, the work of the State Livestock Sanitary Board and the work of the veterinary college.

EXPENDITURES. For the fiscal year ending May 31, 1906, the State Livestock Sanitary Board had available \$45,000.00 for its general work in repressing diseases of animals. Expenditures under this fund may be classified as follows: for tuberculosis cattle, \$23,344.06; for inspecting tuberculous cattle and herds, \$3,886.92; for horses afflicted with glanders, \$2,941; for inspections for the repression of diseases other than tuberculosis, for vaccination, etc., \$4,293.60; for the cost of enforcing quarantines, for materials used in making tuberculin, for making and shipping tuberculin, for the diagnosis of specimens, etc., \$3,369.31; for office and miscellaneous

expenses, \$4,554.46; for the enforcement of the law requiring the inspection of cattle shipped from other states, \$2,670.65.

THE LABORATORY. The laboratory has, unfortunately, lost the services of Dr. Samuel H. Gilliland, who has been connected with it for a number of years and who has been in charge of the production of biologic products and of the diagnosis of specimens sent in since the resignation of Dr. M. P. Ravenel. Dr. Gilliland has also been closely associated with the work upon the immunization of cattle against tuberculosis. He has taken a very important part in the conduct of the incomplete investigations of the State Livestock Sanitary Board in this field. The necessity for his departure on account of ill health is very much regretted.

During the year the laboratory made and sent out 19,880 c.c of tuberculin, 722 doses of anthrax vaccine and 3,699 doses of mallein. A large number of specimens were sent to the laboratory for diagnosis, including the following:

	Positive.	Negative.	Doubtful.	Total.
Rabies,	80	15	2	97
Anthrax,	2	12	.....	14
Tuberculosis,	19	14	.....	33
Glanders,	41	16	.....	57

There were also submitted a large number of samples of milk, tumors, parasites and of pathological material.

Much work has been done to establish the reliability of the method generally used in the rapid diagnosis of rabies, as is explained under the section in relation to that disease. The laboratory diagnosis of glanders has usually depended upon the method of Strauss. In addition to this method, the agglutination test was made with blood serum from 24 horses. The serum of 8 horses agglutinated the bacilli of glanders in the dilution of 1-1000 and over. Several showed a well marked agglutination in dilution of 1-2000. The serum from 16 horses that were free from glanders, caused an agglutination in dilution of more than 1-500 in but one instance, the average being 1-300. The exception caused a distinct agglutination in a dilution from 1-600; in this case the serum was taken from the blood of a horse suffering with acute lymphangitis. All of the work in relation to the diagnosis of rabies and glanders has been carried on by Dr. John Reichel. The result of his work in regard to the agglutination test for glanders indicates that this method is destined to be of service in connection with the control of this disease.

The experimental work carried on at the farm has been under the care of Dr. E. S. Deubler, who has also conducted some of the work of the laboratory. Several important lines of research have been conducted that Drs. Deubler and Reichel who will report through other channels. Dr. C. Y. White continues pathologist to the laboratory. A large amount of pathological work has

been done during 1906 including the rabies work of Dr. Reichel. The following structures and tissues were examined:

Medulla oblongata,	108
Ganglia,	101
Hippocampus major,	108
Cerebellum,	118
Lung,	63
Lymph gland,	27
Liver,	35
Spleen,	19
Kidney,	13
Tumors,	17
Intestine,	4
Miscellaneous,	35

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EXPERIMENTAL FARM. The work of the experimental farm has progressed very satisfactorily in so far as the experiments concerning the vaccination of cattle against tuberculosis are concerned. It is important that other subjects shall be taken up and if this is to be done in connection with the work that is now in progress more accommodations for animals will be necessary, more buildings will be required and more pasture land. With a comparatively little increase in this direction as contrasted with the need for and the value of the work several other subjects that should be investigated can be taken up. It is not possible, for example, to study abortion, calf cholera or infectious garget in connection with the present herd because all of these diseases jeopardize the offspring, and it is necessary, in connection with our tuberculosis vaccination work that young animals shall be produced and raised. Therefore, if these diseases are to be studied, such studies must be made upon separate animals, maintained entirely apart from the present herd.

Some experiments on the breeding of animals are being considered in connection with the cattle that are used in the experiments on tuberculosis. If it is decided that such experiments would be likely to be instructive and important, and if they can be carried on incidentally with the other work it would appear to be wise to undertake them.

The kind of information that this farm and the laboratory of the State Livestock Sanitary Board are maintained to produce is needed upon every farm and by every farmer in Pennsylvania. Individual farmers cannot afford, nor have they the equipment that would make it possible for them to conduct the researches through which relief may be had. Their situation is quite different from that of a corporation that is in position to employ experts to help it. And so governments of all countries have recognized this need as it applies to the individual and the country at large, and have taken steps to meet it, as here contemplated.

GLANDERS. This disease has attained considerable prevalence in Pennsylvania, not so much as a result of spreading within the State, but from repeated introduction from outside of Pennsylvania. It is well known that glanders prevails extensively in some of the

western states and in several of the large cities of the east, particularly New York city. Some of the infected localities are under the jurisdiction of competent veterinary, sanitary officers and others are not. Some states and cities pay very little attention to this subject. The prices of horses have been abnormally high during the past two years. This has served to encourage dealers to gather up and market horses that, under normal conditions, would be regarded as undesirable, if they were not positively unsaleable. Cheap horses have been taken to cities from the country and questionable horses on the ranges and farms and in the horse marts of the west have been spirited away and sold if some question has occurred in regard to their health, on account of the unusual prices that they bring. All of this has resulted in the introduction of an unusual number of glandered horses into Pennsylvania. It has been found repeatedly that horses afflicted with glanders have recently been brought into the state and then, of course, cases occur among horses exposed to contact with these. The following table shows the counties in which glanders occurred, the number of horses condemned and the number of horses exposed and tested with mallein.

County.	Exposed and tested.	Condemned.
Adams,	16	4
Allegheny,	401	59
Armstrong,	18	1
Beaver,	12	4
Bedford,	1	.....
Berks,	3	4
Bradford,	1	.....
Centre,	1	1
Chester, .....	.....	.....
Crawford,	3	.....
Cumberland,	3	2
Delaware,	1	1
Erie,	1	.....
Fayette, .....	.....	2
Franklin, .....	.....	1
Jefferson,	15	2
Lancaster,	12	7
Luzerne,	14	3
McKean,	13	1
Montgomery,	13	3
Philadelphia,	1,177	141
Potter,	1	.....
Susquehanna,	11	6
Union,	1	1
Washington,	2	2
Wyoming,	2	1
York,	110	36
	1,826	283

It will be observed that glanders occurred in 22 counties, that 1,826 horses were exposed and tested and that 283 were condemned and destroyed. Since the largest number of shipped horses are brought to the large cities of Philadelphia and Pittsburg, it happens, naturally that the largest number of cases were found in Philadelphia and Allegheny counties. The large number of cases found in York county resulted from a shipment of two carloads of range horses received during the latter part of 1905. Many of these horses

were infected, and they spread infection among the horses in stables that they occupied. From this center, glanders was carried to some neighboring counties and everything was ready for the beginning of a very extensive and widespread outbreak when the disease was discovered. In connection with the suppression of this outbreak in York, difficulty arose in regard to the destruction of one of the badly infected and manifestly diseased horses. In order that the authority of law for dealing with such cases might be made clear, the following inquiry was sent to the Attorney General:

Office of the State Veterinarian,
Harrisburg, Pa., February 16, 1906.

Hon. Hampton L. Carson,
Attorney General,
Harrisburg, Pa.

Sir: I beg to apply to you for advice on the following subject: The State Livestock Sanitary Board is authorized under the Act approved May 21st, 1895 (P. L. No. 66) to take certain action for the prevention, suppression, etc., of infectious diseases among domestic animals, and, in particular, it is authorized and empowered to destroy animals, as may be necessary. It is, however, provided, that when it shall be deemed necessary to condemn and kill an animal to prevent the spread of disease, and when an agreement cannot be made with the owner for the value thereof, that three appraisers shall be appointed, one by the owner, one by the commission (Board) or its authorized agent, and the third by the two so appointed, who shall, under oath or affirmation, appraise the animal. The Act of March 30, 1905 (P. L. No. 56) provides, in Section 5, certain limits of appraisement, but does not modify the procedure with relation to appraisement. The point in this connection upon which I need information is as to the authority of the State Livestock Sanitary Board to condemn and order the destruction of a horse afflicted with glanders, the owner of which refuses to enter into any agreement as to the value of the animal or to designate an appraiser to represent him. The horse in question is incurably diseased. Glanders is a highly infectious disease, easily transmissible to horses and mules and also to men. The horse is now in quarantine and is kept in a partially isolated stall, from which it is not permitted to be removed, but the conditions are such that the continued existence of this horse on the premises of its owner constitutes a menace to the health of the horses and mules, and to a less degree of persons, in the neighborhood.

Very truly yours,
LEONARD PEARSON,
State Veterinarian.

In response to this inquiry the following reply was received:

Office of the Attorney General,
Harrisburg, Pa., March 15, 1906.

Dr. Leonard Pearson,
State Veterinarian,
Harrisburg, Pa.

Sir: You have asked my advice as to the authority of the State Livestock Sanitary Board to condemn and order the destruction of a horse afflicted with glanders, the owner of which refuses to enter into any agreement as to the value of the animal or to designate an appraiser to represent him.

I answer that the Acts of May 21st, 1895 (P. L. 91) and March 30th, 1905 (P. L. 78) both relate to the prevention and suppression of dangerous, contagious and infectious diseases among domestic animals. The first Act provides for the establishment of the State Livestock Sanitary Board. The second Act defines the duties and powers of the Board, providing in Section 5 certain limits of appraisement with respect to animals that the Board deems it necessary to destroy in order to prevent the spread of disease, but this section does not modify the procedure with reference to appraisement.

I am of opinion that the appraisement should be made under the first named Act, observing the limits set up by the second. If the owner of the animal condemned to death refuses to appoint an appraiser under the sanction of the Act of 1895, and otherwise obstructs the Board in carrying out the provisions of the Acts referred to, he can be prosecuted under Section 5 of the Act of 1895. I can find no way pointed out by which he can be compelled to designate an appraiser, but as Section 2 of the Act of 1895 confers abundant power upon your Board to order the destruction of the horse in question, provided it is deemed necessary for the suppression of dangerous, contagious and infectious diseases among domestic animals, I do not hesitate to advise you that you are authorized to employ the most efficient and practical means for the prevention, suppression, control or eradication of dangerous contagion or infection, and that, if you are satisfied that the horse is incurably diseased; that glanders is a highly infectious disease easily transmissible to horses and mules and also to men; and that the horse now in quarantine constitutes a menace to horses and mules, and, in a less degree, to persons in the neighborhood, you have the power to take and kill the horse. If you are resisted, the person so resisting should be dealt with under Section 5 of the Act of 1895. You are, of course, authorized to employ such force as is necessary to enable you to execute fully your duty.

Very respectfully,

HAMPTON L. CARSON,
Attorney General.

The general system for dealing with glanders has not been changed. The agglutination test for diagnosis has been used experimentally, and as the test proves to be satisfactory, its use is to be extended.

On account of the unusual number of cases of introduced glanders, it has been proposed, from several sides, that an inspection ought to be made of all horses entering Pennsylvania from other

states. In reference to this suggestion, it may be said, a great many horses suffering with incipient glanders show no symptoms of disease. A large number of horses exposed to glanders and in condition to develop it might readily be passed as sound if nothing but a physical examination is relied upon; therefore, to render it possible to exclude, with accuracy, horses afflicted with glanders in the early stages, it would be necessary to submit all horses to the mallein test or to make the agglutination test with a sample of blood sent to the laboratory. This would occasion considerable delay in the shipment of horses and would be an expensive procedure. The cost would amount to not less than \$1 per horse. The cost would, in any case, be very much greater than the cost of dealing with the outbreaks of glanders as they arise. If the disease can be controlled in Pennsylvania at a cost of \$10,000 a year, and it is not likely to be more than this, it would seem to be unjustifiable to incur an expenditure of \$50,000 to \$100,000 a year to keep glanders out of the State. Of course there is another side to the question in addition to the economic side that is referred to, and that is the public health relation of this disease; glanders is transmissible to man and deaths from glanders occur occasionally among persons infected from horses. Fortunately, this danger is small and can be almost entirely avoided by promptly reporting horses with glanders as is required by law, so that they may be disposed of by the state veterinary service.

The most important point in connection with the control of this disease is prompt reporting, on the part of horse owners and veterinarians. If all cases were reported just as soon as glanders is known to exist, or is suspected, these losses, and the attendant dangers, would be very much less than they are.

ANTHRAX. Anthrax has occurred during the past year in the following counties: Berks, Bradford, Chester, Erie, Lancaster, McKean, Potter, Susquehanna, Tioga, Warren and York. 63 cows, 2 mules and 2 horses are known to have died of anthrax (other deaths from this cause are probable), and 661 animals were vaccinated. The Pasteur system of vaccinating has been modified to the extent of using two vaccines instead of three. In some cases, however; that is, where the infection is particularly severe and the danger is esteemed to be unusually great, a third vaccination is made. The results from vaccination have been very satisfactory. It has happened in two instances that animals have died after the first vaccination. A laboratory study was made of one of these cases and it was found that death resulted from anthrax. The culture recovered revealed an organism of much higher virulence than that of the vaccine, and so it was considered that the animal must have become infected from an outside source, either before it was vaccinated or shortly thereafter. In this case, there was no swelling at the seat of inoculation, that is at the place where the vaccine was injected; this was regarded as evidence in favor of infection from some other source. The number of anthrax cases appears to be diminishing as the centers of the disease have been located and are kept under surveillance.

BLACKLEG. Blackleg has occurred during the past year in the following named counties: Bradford, Butler, Cambria, Clarion, Clear-

field, Erie, Huntingdon, Lycoming, Montgomery, Potter, Somerset, Susquehanna, Wayne, Warren, Westmoreland, Wyoming and York. 134 farms in these counties were believed to be infected with black-quarter, because the disease has occurred upon them during recent years, or because it has occurred under similar conditions on other farms in the same neighborhood. 123 animals died on these farms before vaccination was applied. 1,396 animals were vaccinated. There were no deaths from blackleg following vaccination, so far as is known.

HEMORRHAGIC SEPTICAEMIA. This disease occurred during the year in the counties of Chester, Clearfield, Cumberland, Luzerne, Potter, Tioga, Venango and Warren. 106 horses and cattle died. Unfortunately, there is at present no means available for vaccinating cattle against this disease. It is believed that there is much more hemorrhagic septicaemia among cattle in Pennsylvania than is reported, and that it is a common cause of death. Many cattle and some horses pasture on mountain land, and it is in such regions that the disease is most frequent. It appears to be probable that animals become infected with the organisms of this disease very much as they do with the organism of anthrax, that is through the respiratory and the digestive tracts and through inoculation by means of wounds in the skin. On account of the seat of the most common lesions of the disease, there are some who believe that it is by inhalation that infection most frequently occurs. The mode of entrance of the germs of the disease is not of so much importance as their source. As the disease is one of locality, it seems to be probable that the soil may harbor the contagion. This points to the necessity for disposing of the carcasses of infected animals in such a way as to prevent the infection of the soil. All carcasses of animals that die of hemorrhagic septicaemia, as well as all carcasses of animals that die of anthrax or blackquarter, ought to be cremated as close as possible at the spot where death occurs. The chronic form of hemorrhagic septicaemia that is described in some of the western states, and especially in Minnesota, has not been recognized in Pennsylvania. The form of hemorrhagic septicaemia that occurs here is acute and is characterized by the occurrence of numerous small hemorrhages upon the serous membranes, in the lungs and in the subcutaneous connective tissue, by serous and sometimes bloody infiltration in the connective tissue about the larynx, the throat and the head, and by small hemorrhages upon the intestines. The lungs frequently show acute pneumonia accompanied by serous infiltration in the interlobular connective tissue. A symptom that is occasionally observed is hemorrhages through the skin, occurring as fine drops, as though the skin had been pricked with a needle. The disease is nearly always fatal.

Additional laboratory studies of this disease are urgently needed, and are being made as opportunity offers.

Each reported case is investigated and advice is given as to the removal of cattle from infected lands, as to their quarantine until the period of incubation is past before removal to uninfected farms, and as to the proper disposal of carcasses.

TEXAS FEVER. During the past year a number of cases of Texas fever occurred. 30 cows died; 19 affected recovered. These 49 cases were among 225 cattle, chiefly cows, and nearly all were shipped from Ohio and Chicago to points in eastern Pennsylvania. Examination showed a few ticks on the affected animals. It was thought, at first, that infection had occurred in the west or, possibly, at the Pittsburg stockyards. Both of these possibilities were looked into with the result that no evidence could be found which tended to connect either the point or origin or the Pittsburg stockyards with the occurrence of the disease. It was not until Texas fever occurred among some cattle shipped from Bradford County, Pa., to Chester County that the source of infection was traced with any degree of probability. It was found that these cattle had been unloaded in transit at Harrisburg and subsequent investigation showed that on the 20th of July a carload of southern cattle was unloaded at the Harrisburg yards and were kept there about four hours. These cattle were unloaded on account of an injury to the car that they were in. They occupied a pen used in the usual course of the business of the yards. There is no pen at Harrisburg that is reserved for southern cattle. The cattle from Troy, Bradford County, occupied the yard at Harrisburg September 22; the first case occurred among the cows of this shipment October 7th and during the next few days 9 additional cases occurred. Steps were immediately taken to clean up and disinfect the Harrisburg stockyards. No further trouble occurred after this was done.

RABIES. Rabies among dogs has occurred during the past year in the following named counties: Allegheny, Berks, Bucks, Butler, Cambria, Carbon, Centre, Chester, Clearfield, Columbia, Crawford, Delaware, Fayette, Franklin, Indiana, Jefferson, Lancaster, Lebanon, Lehigh, Luzerne, Mercer, Montgomery, Montour, Philadelphia, Schuylkill, Somerset, Susquehanna, Venango, Warren, Washington, Wayne, Westmoreland and York. 517 dogs died of rabies or were destroyed on account of exposure. 20 cattle and 5 horses died of rabies. 58 people were bitten by dogs that were known to have been rabid, of whom several died, presumably of rabies. General quarantines were established covering all of the dogs of districts in the counties of Delaware, Fayette, Jefferson, Schuylkill, Somerset, Venango and Westmoreland. Where it is possible to control an outbreak of rabies by the quarantine of individual animals, known to have been exposed, this method is adopted. In some outbreaks, however, it is not possible to determine just what animals have been exposed and so, in order to include all of them, a general quarantine becomes necessary. The period of quarantine is usually 100 days. This period is selected because it covers the period of incubation in practically all cases. It may be that the period of incubation for rabies exceeds 100 days in from one to two per cent. in all cases. Statistics on this point vary somewhat, but this appears to be a fair statement. When the period of incubation exceeds 100 days it may run to several months, possibly for six or eight months. It would not be possible or proper to keep all dogs in quarantine for the maximum period of incubation of eight months unless it were planned to entirely exterminate rabies in some large districts in accordance with the method developed and followed successfully in several Eu-

ropean countries, and notably in England. The success of the English authorities in completely exterminating rabies has been most instructive. It serves to demonstrate conclusively that rabies is not a disease that originates spontaneously, but that it is propagated wholly by infection from diseased animals. Of course it was not necessary to await the extermination of rabies in England from a long continued and long enforced muzzling order to come to these conclusions, but this added proof ought to be of some service in convincing those people who hold aberrant views on rabies as to the accuracy of the conclusions of veterinarians in regard to the modes of origin and distribution of this disease. Attention has been called in previous reports to the difficulty that has been experienced in connection with the control of rabies as a result of the amazing views in regard to this disease that originate from unreliable sources and that have been disseminated by some papers. Fortunately, the newspapers have not given these false doctrines so much publicity as they formerly received. During the past year, however, statements have been circulated to the effect that there is no such disease as rabies, or, if there is such a disease, that it is very rare and of little importance. These statements spring from people who claim to be interested in the welfare of animals and who endeavor to convince the public that there is less harm in permitting rabies to run its course than in the measures that are adopted to check it. Such teachings are exceedingly dangerous, because they tend to disorganize public sentiment, to upset the views of poorly informed people as to the need for certain measures adopted for the purpose of repressing rabies, and they tend to retard people that are exposed to rabies from taking the precautions and treatment that may be necessary in order to enable them to escape infection. The question is sometimes asked: "Do you believe in rabies?" as though the question were one of philosophy or religion. It is as sensible to inquire: Do you believe in smallpox, or do you believe in wheat. The existence of one can be as completely demonstrated as the existence of the other. There is no more room for doubt as to the existence of rabies than doubt as to the existence of any other definite disease as measles or typhoid fever or any physical object.

Rabies is a disease that occurs chiefly in dogs. It is characterized by a variable period of incubation, usually occurring within 12 to 30 days, by symptoms expressive of derangement of the nervous system and including some paralysis of the throat, by altered demeanor, irritability, a tendency to roam and, at times, to attack animals and people; at such times the animal may be overcome by an uncontrollable impulse to bite, but these paroxysms are intermittent. The disease terminates in most cases within five days. Death is preceded by great weakness and by local, and, later, by general paralysis. After death, certain well marked and highly characteristic alterations are found in the central nervous system. The disease is communicable by inoculation with certain tissues or fluids of the diseased animal. Experiments have shown that the most virulent portions of the body are the central nervous system and the glands. The secretion from the salivary glands contains the infective principles of the disease and when saliva is implanted in a wound, as occurs when a rabid dog bites an animal or person, this implantation may result in the infection of the animal so exposed. All

animals or persons bitten by rabid dogs do not become infected for the reason that saliva is not always introduced into the wound. The secretion may be scanty, the mouth of the dog may be rather dry, the saliva may have been wiped from the teeth as they pass through clothing or through the outer layers of the skin; the infectious material may be washed from the wound by the flow of blood, or by efforts at cleansing or by sucking, or it may have been destroyed by the use of antiseptics. If a rabid dog bites a number of animals in quick succession, those last bitten are less exposed, because the infectious material on the teeth of the dog is in smaller quantity. All animals, including man, have a certain amount of resistance to infection by the virus rabies as by the virus of other diseases, hence a certain amount of virus may remain in the wound and still not produce infection, because the minimum quantity that is required to infect that particular individual is not present. From these causes it results that only about 15 per cent. of the people bitten by rabid dogs are likely to develop rabies, even if not subjected to the Pasteur treatment. Of domesticated animals bitten by rabid dogs, a large percentage develop rabies approximately 50 per cent., and for the reason that the wound receives less careful treatment, and because the body is not protected by clothing.

Following infection from the bite of a rabid dog, at the expiration of the period of incubation, symptoms occur that are, practically, the same as those shown by the animal that conveyed infection. The, so called, anti-hydrophobists claim that people that develop rabies following the bite of a rabid dog are really infected with hysteria, from fear. This alleged explanation fails to account for the occurrence of precisely the same condition in children or in infants who have no fear of rabies, and in animals.

Early diagnosis is of the utmost importance in the control of this disease. Where it is suspected that an animal is afflicted with rabies and, particularly, if a person or other animal has been bitten, the suspected animal should be confined, and the course of the disease should be observed. It is often possible to confine suspected dogs. If, however, the animal cannot be confined, it should be destroyed. The head should be removed with the two upper-most cervical vertebrae; these should be thoroughly wrapped in parchment paper, oil cloth or other impervious material, packed in ice, in a large bucket, covered over, and sent to the Laboratory of the State Livestock Sanitary Board, corner 39th street and Woodland avenue, Philadelphia. If it is found that the animal was afflicted with rabies, a report to this effect is at once forwarded to the sender of the material, and measures are instituted to prevent the spread of rabies by animals that may have been exposed.

It is possible now, by means of a microscopic examination, to determine, within a few hours, whether a given animal was afflicted with rabies, unless the animal was killed in the earliest stages of disease before there was a chance for the characteristic lesions to develop. The following report on the examination for rabies has been prepared by Dr. John Reichel, who has been in charge of this work for the State Livestock Sanitary Board during the past year:

"The following is a report with a summary of the facts brought out, in the examination of 248 animals for rabies.

	Positive.	Negative.	Doubtful.	Total.
Dogs,	150	18	2	170
Horses,	1	5	1	7
Cows,	3	1	2	6
Cats,	3	1	.....	4
Rabbits,	37	8	1	43
Guinea pigs,	12	3	.....	15
Children, .....	.....	12	.....	12

266, or 83.1 per cent. positive diagnosis.

58, or 19.6 per cent. negative diagnosis.

6, or 6.3 per cent. result in doubt.

As soon as a specimen for examination was obtained, where possible, the following structures were taken for examination: the medulla oblongata, examined for Babes' endothelial cell proliferation, the "rabid tubercle;" the gasserian ganglion and sympathetic ganglion, examined for Van Gehuchten and Nélis' proliferation changes, and the hippocampus major and cerebellum for the presence of Negri bodies. A small portion of the cerebellum was saved in sterile glycerine for animal inoculation, where this was thought necessary.

"In the examination of the 248 specimens, the diagnosis was made solely upon the presence or absence of proliferation changes in 113 cases. In 77, both the proliferation changes and Negri bodies were sought for. The diagnosis was based upon the presence or absence of Negri bodies alone in 49 cases. In 9 cases neither method was of value; the experimental animal inoculation method was here resorted to.

"The recent date of the discovery and the announcement of the diagnostic value of the Negri bodies accounts for this method of diagnosis not being used in all cases. As is shown in the accompanying table, the changes in the medulla oblongata namely, Babes' endothelial cell proliferation or "rabid tubercle," are not always reliable and the Van Gehuchten and Nélis endothelial cell proliferation changes in the ganglion are at times found when rabies does not exist. This accounts for the omission in examining the structures where these changes are usually found in many of the more recent specimens:

"In positive cases of rabies:

	Medulla oblongata.	Gasserian ganglion.	Sympathetic ganglion.
Proliferation changes found in,	51, or *65.5	135, or *100	28, or *82.4
No proliferation changes found in,	41, or *33.5	.....	6, or *18.6

*Per cent.

8—7—1906.

"In suspected cases of rabies (negative):

	Medulla oblongata.	Gasserian ganglion.	Sympathetic ganglion.
No proliferation changes found in,	29, or *96.6	18, or *69.2	3, or *60
Proliferation changes found in,	1, or *3.3	8, or *31.8	2, or *40

*Per cent.

"In positive cases of rabies:

	Hippocampus major.	Cerebellum.
Negri bodies found in,	91, or *97.9	93, or *99
No negri bodies found in,	2, or *2.1	1, or *1

*Per cent.

"In suspected cases of rabies (negative):

	Hippocampus major.	Cerebellum.
No negri bodies found in,	26, or *100	25, or *100
Negri bodies found in,		

*Per cent.

"From the table, the following conclusions may be drawn: In that it was impossible to find the changes described by Babes' in 33.5 per cent. of the specimens of the medulla oblongata examined from positive cases of rabies, the changes in this structure must be regarded as unreliable.

In not a single positive case examined were the Van Gehucten and Nélis' proliferation changes not found, but as the changes were found in several ganglia from cases not rabid, as proven in that the experimental animals inoculated failed to develop the disease and the absence in every case of the Negri bodies, shows that a diagnosis based entirely upon these changes must be guarded. The sympa-

thetic ganglia were examined in many cases to determine their value in the diagnosis of rabies by the presence or absence of the proliferation changes. The changes in the sympathetic ganglia were found to be more constant than the changes in the medulla oblongata but, like the changes in the gasserian ganglia, they were also found in several cases shown not rabid by experimental animal inoculation and by the absence of Negri bodies.

"Negri bodies were sought for in 126 cases, they were found in 99 and absent in 27. Where the Negri bodies were not found, experimental animal inoculations were always made, and it was learned that in two cases rabies developed in the experimental animals inoculated, although Negri bodies were not found in the nervous system from which the experimental animals were inoculated. The history of these animals, however, shows that both were killed early in the course of the disease.

"Of the many negative cases examined, including the 27 negative suspected cases and the nervous systems of healthy animals and animals dead of the diseases, Negri bodies have not been found in a single case.

"The hippocampus major usually shows the Negri bodies in the greatest number but they are just as constantly present in the cerebellum when none were found in hippocampus major. Although the hippocampus major and cerebellum are the usual structure examined for Negri bodies, they have been found in the olfactory lobes (quite numerous) cerebral cortex (not constant); medulla oblongata, gasserian and sympathetic ganglia and in the cervical region of the spinal cord.

"Little work has been done in studying the nature of the Negri bodies outside of staining them and perfecting the method by which they can be demonstrated in the quickest way.

"The smear method, published by Drs. Anna Williams and May Murray Lowden of the New York Board of Health, appears to be the most accurate and quickest way to demonstrate the bodies so far proposed. In no case where the Negri bodies were not found by the use of the smear method were they later found in sections made and stained from the various structures usually examined. By the use of this method, Negri bodies have been demonstrated in from 15 to 30 minutes.

"To permit a suspected rabid animal to live and develop observable clinical symptoms is quite as important in the making of a diagnosis in the examination for Negri bodies as it has previously been shown when the proliferation changes were alone sought for. That the Negri bodies may be found earlier than the proliferation changes in the gasserian ganglion, may be true, but neither is found much earlier than the appearance of clinical symptoms."

HOG CHOLERA. Hog cholera occurred during the past year in the following counties: Armstrong, Bedford, Blair, Berks, Bradford, Bucks, Centre, Columbia, Cumberland, Dauphin, Forest, Franklin, Lancaster, Lebanon, Jefferson, Luzerne, Lycoming, McKean, Montgomery, Perry, Susquehanna, Union, Venango, Westmoreland and York. The disease was not widely scattered in the counties in which it occurred excepting in Cumberland county, where 66 farms

were involved. The total number of farms in the State where hog cholera occurred was 118. As the herds of hogs were in all cases small the total losses were not large. 556 hogs were involved, and of these 290 died of cholera or were killed because they were diseased. The reason for the comparatively small prevalence of cholera during the year is that very few hogs have been brought to Pennsylvania from western points, excepting for immediate slaughter. It is now well understood that hogs are likely to be exposed to hog cholera in stock cars or in stockyards, and if they are kept a couple of weeks after shipment many of them would develop disease. Therefore, the hogs kept in Pennsylvania are nearly all of them grown in Pennsylvania and the hogs that are shipped in go to slaughter houses where they are promptly disposed of before they have an opportunity to develop cholera. So far as home grown hogs are concerned, there is practically no infection in the State. When the disease occurs the premises involved are quarantined and the quarantine is maintained until the disease is abated, the exposed hogs slaughtered and premises disinfected.

MANGE OF HORSES. A few cases of mange were discovered during the year among horses in the following named counties: Berks, Centre, Chester, Delaware, Juniata, Lackawanna, Lebanon, Montour and Philadelphia. The total number of cases reported was 40. In each case a quarantine was established with relation to the diseased horses and these horses were treated with the lime and sulphur wash until cured. This wash is made as follows:

LIME AND SULPHUR WASH FOR HORSES.

Place one half pound of unslacked lime in a bucket or kettle. To this add enough water to form a paste. Into this paste, sift one and one half pounds of flours of sulphur and stir the mixture well. Place the sulphur-lime-paste in a kettle with about 3 gallons of water and boil. The boiling should be continued until the sulphur disappears, or almost disappears, from the surface, which will require from one to three hours. The solution is then of a chocolate or liver color. Water may be added as necessary.

Pour the mixture and sediment into a bucket and allow 2 or 3 hours for the sediment to settle, then carefully dip off the clear liquid taking care not to disturb the sediment. Place this liquid in a wooden receptacle or keg that can be closed tightly to exclude air, or in a glass receptacle, such as a large demijohn. To the clear liquid thus dipped off, add enough water to make six gallons. The sediment should be thrown away. This mixture can be used freely for washing the horse. As it stains the hands of the person using it (although it does not harm otherwise, and the stain does not last long) it may be applied with a sponge attached to the end of a stick. About one half of the body of the horse should be covered at a time; that is, on a single day, and the application should be repeated at intervals of 2 or three days so long as may be necessary.

FORAGE POISONING OR CEREBRO SPINAL MENINGITIS OF HORSES.

This disease occurred during the last year in many parts of the State. As it has been difficult to get reports on its occurrence any statement as to its prevalence will be far from complete. Nu-

merous complaints as to forage poisoning have come from the counties of Adams, Cumberland, Lancaster, Philadelphia, Wyoming and York. A laboratory study of this disease is being made and some interesting and important facts are being developed. It is hoped that they will be available for publication in the near future.

TUBERCULOSIS. Tuberculosis of cattle has been found in practically all parts of Pennsylvania. It is the most widespread of the infectious diseases of farm animals. It causes great losses to cattle owners; this loss occurs in several ways. The direct loss of infected animals is large, but greater losses occur from the lowered productiveness of infected animals, that is, from the loss of condition, from the loss of food consumed for which no adequate return is made, from the loss of breeding value.

During the year, it has been necessary to condemn 1,536 tuberculous cattle from 858 herds. A very much larger number of tuberculous cattle than this is annually disposed of to cattle buyers, who resell them for slaughter. The tuberculous cows that are appraised and paid for by the State are the property of conscientious men who would not knowingly sell an infected animal where it might spread disease, or they are cows that are suffering with tuberculosis in such advanced forms that they are not salable, or they are cattle that react to the tuberculin test when this test is applied to the entire herd. No harm can come from the sale of tuberculous cattle for slaughter provided they are taken to a properly equipped slaughter house that is under competent veterinary meat inspection, as is required and provided by the federal government. Under such conditions, the meat can be adjudged in accordance with the rules provided for the guidance of meat inspectors in disposing of carcasses of tuberculous cattle. These rules provide for the condemnation and destruction of the flesh of animals infected with tuberculosis of such extent or distribution as to render it possible that the meat may be unwholesome. On the other hand, if the disease is of such limited extent or distribution as to make it clear that the meat cannot be infected, it is not required under the rules, to be condemned and it is permitted to be sold. In such a slaughter house, precautions are taken to keep the establishment clean and, when necessary, to disinfect it, so as to avoid the contamination of meat from any infectious material that may have been brought into the slaughter house by animals previously killed. Before entering a slaughter house, animals should be subjected to a physical examination, so that those that are manifestly diseased, or that show evidence of a condition that may possibly indicate the existence of lesions that might require the condemnation of the flesh, may be killed outside of the slaughter house for fertilizer or, if in the slaughter house, separately, and under special supervision, so that no harm may result.

Some people have taken an extreme position in regard to the use of the flesh of animals that may have reacted to the tuberculin test, or that show limited, local lesions of tuberculosis. They say, all animals with tuberculosis, even in the least degree should be killed outside of the slaughter house and their flesh rendered into fertilizer. It is necessary to point out to those who hold this view that there is a distinction between local and general disease and that in a great

many cases, the lesions of tuberculosis consist in a local focus or tubercle in some one of the internal organs, often in a lymphatic gland, and there is no evidence or reason to believe that in such cases the influence of the local infection extends beyond the tissues actually involved. A considerable percentage of cattle, especially those raised in dairy herds of eastern states is infected with tuberculosis in some degree, unless special measures have been taken to free the herds from infection. Some animals containing local lesions of tuberculosis are in first class physical condition; they are fat, sleek, all of their functions are normal and there is no evidence of ill health unless tested with tuberculin when they will give the characteristic reaction, and soon return to an apparently normal conditions.

The question may sometimes be asked: Why should such an animal be condemned and ordered to be killed when, upon post-mortem examination, it was found by the meat inspector that the flesh may safely be used as food? In reply, it should be said that strictly speaking, such animals are not condemned by the State and ordered to be killed. It is only required that they shall be cared for in such a way that they may not be able to spread infection. Every animal that reacts to the tuberculin test in a characteristic way is believed to be afflicted with tuberculosis and every animal that is afflicted with tuberculosis is a possible distributing center of infection. Of course, all animals with tuberculosis do not, in all stages of the disease and at all times, eliminate and distribute the germs of tuberculosis, but even if an animal is not spreading tuberculosis at a given moment, if it is infected with tuberculosis there is the probability that it will, within a shorter or longer time, develop disease to such a point that tubercle bacilli will be excreted. Consequently, if the disease is to be eradicated from a herd it is absolutely necessary that every animal with tuberculosis, even those that have it in the slightest extent, must be removed from contact with cattle that are healthy, unless these healthy cattle have been immunized from tuberculosis by vaccination. The condition may be compared to a fire in the cargo in the hold of a ship. A fire may smoulder in a bale of cotton for days and weeks, and make little progress. The efficiency and safety of the ship are not impaired, but there is always the danger that the fire may extend and cause much damage, possibly the destruction of the ship. So it is with tuberculosis in the body of an animal. The smouldering ember may be minute; it may not extend materially for a long time; it may, in some cases, become extinguished from the operation of natural causes, but so long as it is there it is a constant source of danger and the animal that carries it should not be placed in contact with sound, unimmunized animals, nor should the milk of a cow so afflicted be used in the raw state for food. On the other hand, if an animal is killed a post-mortem examination will show the precise location, extent and character of the lesion. Unfortunately, this information cannot be had during the life of the animal. If it is found that the conditions are such as to show that the lesion has not progressed beyond what is known as local tuberculosis, the infected parts of the body may be destroyed and the flesh may safely be used as food. If such an animal can profitably be kept apart from healthy cattle and its milk can profitably be used, after adequate pasteurization, there is no reason why it should be destroyed and it is not required by the State that it

shall be destroyed. The only thing the public is interested in, in this connection, is that communicable diseases shall not be distributed. There is no requirement that tuberculosis cows shall be destroyed so long as they are so maintained that they cannot distribute infection. That is to say so long as they are kept apart from healthy cattle, in quarantine, and the milk is pasteurized before it is used. Cows in the earliest stages of tuberculosis produce sound calves. These calves remain sound if they are removed from contact with their tuberculosis mothers soon after birth and are reared on milk free from living tubercle bacilli. The Danish system for controlling tuberculosis of cattle is based on this knowledge and is very successful in practice.

In this State, there appears to be little opportunity for the utilization of cows that are known to be infected with tuberculosis, because there is a very restricted market for their milk. The most economical way of using such milk is to pasteurize it, make butter of the cream and feed the skimmed milk to young animals.

It is as straining at a gnat and swallowing a camel to object to the sale and use of the flesh of animals that show slight lesions of local tuberculosis, so situated that they may be entirely removed, and destroyed and to permit without objection, the sale and use of the flesh of animals killed in slaughter houses that are not under inspection when it is perfectly well known that many of these animals are afflicted with tuberculosis in such an advanced form that their flesh would be condemned by a meat inspector, were one present. This question, as to when and under what conditions the flesh of an animal with tuberculosis becomes unwholesome, has been studied for a long time by many thoroughly competent investigators. It has been shown, positively, by these researches, that the flesh of tuberculosis animals is not infectious excepting in advanced cases. All of the official rules on meat inspection that have been adopted in all European countries and in this country, and those that have been approved by the Pennsylvania State Livestock Sanitary Board, call for the condemnation of meat not only where there is a probability but also where there is a possibility that it may be unwholesome. In other words, it is not passed for use for food if there is a possibility that it may be unwholesome.

Undoubtedly, a very large amount of unwholesome and dangerous tuberculous meat is sold in the markets of the State. But such meats are not prepared in slaughter houses under inspection. It is derived from the carcasses of animals killed surreptitiously in uninspected slaughter houses. Not only is the unwholesome meat from such animals sold, but the slaughter house is not likely to be cleaned and surely it is not disinfected, so that the flesh of the next animal that is killed there, even if the animal itself be sound, may become contaminated and dangerous to health.

Reference was made in the report for 1903 as to the desirability of establishing better methods for disposing of cows that are known to be infected with tuberculosis. The State Livestock Sanitary Board is not prepared to provide compensation for all of the tuberculous cattle that are reported. It is still less prepared to provide compensation for all of the tuberculous cattle that might be found if a systematic inspection of dairy herds were instituted. Conse-

quently, this outlet for tuberculous cattle, through appraisal and destruction by the State is not sufficient. The only other outlet that is available is the slaughter house, and to butcher milch cows is to incur great loss. Many of these cows might safely be used for varying periods, up to a few years, in the dairy and for breeding if certain and well known and perfectly well understood and established precautions were observed. If certain farms could be provided and set aside for maintaining herds of cows that have reacted to the tuberculin test, this would provide another outlet for such animals, no farmer desires to keep tuberculous cows in contact with healthy cows. Such exposure occurs through the unwitting purchase of infected animals and then through keeping them in ignorance, or from the fact that to dispose of them would cause more loss than the farmer feels he is able to bear. If there were a certain demand for reacting cows from men who would isolate them and keep them under the strict, sanitary supervision that would be necessary, an additional encouragement would be afforded the owner of tuberculous cows to get rid of them by providing a higher price than is paid by the State. This would greatly facilitate the concentration and sequestration of infected cows, under conditions where they could be carefully watched and their products pasteurized so that they could do no harm, and would tend to encourage their removal from unwatched, uninspected herds where they now exist in large numbers and where the raw, virulent milk is sent to market without pasteurization or restriction of any kind.

The above suggestion has been made by me before, but it has not been possible to put it in operation and it may not be in the near future. It is believed, however, that it is well to make the suggestion so that this and other plans may be considered to the end that a method may be found for ridding our herds more rapidly of tuberculosis.

The cows that spread the greatest amount of infectious material are those suffering in the more advanced stages of disease. It is required that all such animals shall be reported to the State Livestock Sanitary Board and that they shall be destroyed. Unfortunately, however, there is no provision for searching for such animals through the agency of a systematic inspection of dairy herds. The time is rapidly approaching when such an inspection will be demanded both by the producers and consumers; by producers for the protection of their herds and for the improvement of their markets and by the consumers for the protection of health.

A good deal of progress in the repression of tuberculosis of cattle is being made, but the disease is so widespread and so dangerous that it is desirable that more rapid progress shall be made. The question is largely one of finance. The method for dealing with tuberculosis is the same as described in detail in the report for last year. Considerable progress has been made in relation to the vaccination of herds against tuberculosis. The present status of our work in this direction is as stated in the following address by the State Veterinarian to the Eastern Guernsey Breeders' Association, Bala, September 18, 1906.

THE VACCINATION OF CATTLE AGAINST TUBERCULOSIS.

"It is not my purpose to attempt a discussion of the general subject of tuberculosis of cattle or the relation of this disease to the public health, for you have invited me to give an account of the work that has been done under the auspices of the Pennsylvania State Livestock Sanitary Board upon the immunization of cattle from tuberculosis, and it will require as much time as is available to properly present this part of the great tuberculosis question. Still, it may not be inappropriate in passing to refer briefly to some of the more recent developments in the broader field in so far as this will throw light on the trend of scientific development in relation to this subject and help to make clear the principles underlying and the reasons for the application of vaccination against tuberculosis of cattle.

"The economic importance of tuberculosis of cattle is becoming greater each year. This is partly due to the greater prevalence of this disease, in most states and, therefore, to greater actual destruction from it, and is partly due to more complete recognition by breeders to the necessity for controlling it.

"There can be no profit or satisfaction in breeding or propagating tuberculosis. Yet this is what many breeders are doing. And it is what many have done until the disease developed so much faster than the cattle upon which it might feed that herds have been wiped out or so depleted that they could not be maintained profitably. In other cases, the disease is controlled to such an extent that it does not destroy the herd outright but it may be constantly eating into its substance, every now or then a cow or promising heifer will be observed to lose condition from no cause that is apparent until it becomes necessary to dispose of her, or she may die; few cows in an infected herd reach advanced age, there is a general lack of stamina and of productivity with occasional complete losses. It is discouraging to have to depend on such a herd, the outcome of each individual is so uncertain, it is like always pulling up stream.

"Some breeders have been so fortunate as, without effort or plan, to have escaped the infection of their herds, but such men are few and, where there is much interchange of cattle with other breeders, infection is avoided only by the most careful watchfulness and by the use of certain special measures, the principle of which is based on the intelligent use of the tuberculin test.

"It is gratifying to know that tuberculosis is not hereditary and that calves from infected cows may be reared in health by protecting them from contact with the germs of this disease. This has been abundantly proven. It has however been so extremely difficult to bring this fact home, and to lead to its being acted on that it has not served the purpose that it ought to serve. The Bang system for controlling tuberculosis is based on this principle. But it is important to note that the Bang system has never been widely used outside of Denmark and its use is diminishing rather than growing in that country. This is not because it is not effective—it is effective—but because it involves extra labor, watchfulness, care and expense for such a long time that only a few herd owners have the courage and perseverance to carry it out. It is unfortunate that this is so for this system furnishes a method to gradually eradicate tuberculosis

at a minimum of loss. It is conservative to the last degree. Those who have carried it out correctly have had good results. But we have to take the facts as they are and to recognize that the Bang system in its entirety is not likely to be used extensively in this country.

"The other methods that have been proposed for the repression of tuberculosis are much more expensive because they involve the loss of the breeding value of infected cattle and usually require their destruction. While under present regulations it is possible to save the beef value of some infected cattle, this is of little importance in regard to most dairy herds.

"It has long been evident that if some more economical method for the control of tuberculosis could be devised and placed in operation it would have a marked effect on the development of improved breeds and on the gradual betterment of the average herds, through the use of better blood.

"Many men refrain from paying high prices for cattle and from maintaining pure bred herds on account of the prevalence of tuberculosis. Many breeders, of nearly all breeds, have given up breeding, and some have been ruined on account of the ravages of tuberculosis. It is not pleasant to dwell on this subject but we must be brave enough to look squarely at the question, and to attempt to measure it. And if a satisfactory remedy can be found even a grave ill need not terrify us.

"The studies that have led up to a development of a process for vaccinating cattle against tuberculosis have covered many years. It was in an effort to isolate a substance to increase resistance to tuberculosis that Koch discovered tuberculin in 1880. This material does not possess the properties that were at first ascribed to it but it is of the greatest value as a diagnostic and is of considerable value in treating tuberculosis of man as is shown by the constantly increasing dependence that is being placed on it.

"Following this discovery, a great many extracts and preparations of tubercle bacilli and their cultures were prepared but none was sufficient to increase the resistance of an animal to a useful degree until living tubercle bacilli were employed, non-virulent for the animal treated. This use of the living germs of a disease for the purpose of securing protection from the disease caused by more virulent germs of the same species was first employed by Jenner in relation to smallpox. The germs of smallpox when grown on cattle are thereby so changed that they become incapable, when inoculated upon man, of producing smallpox but they do cause a small eruption at the point of the inoculation and following this the vaccinated person becomes immune to smallpox. This principle was employed and its application was extended by Pasteur in relation to the diseases, fowl cholera, anthrax and rabies. It has also been applied successful in respect to blackquarter, swine erysipelas and other maladies.

"Among the first attempts to apply this principle to tuberculosis were those of Dixon, Trudeau and deSchweinitz, all in this country. But the scientific groundwork for the development of this method was laid in 1896 and 1898 by Theobald Smith who discovered that although tuberculosis is widely distributed through the mammalian

series all tubercle bacilli from the tissues of tuberculous mammals are not the same. In particular he discovered certain differences between the forms found in the sputum of consumptives and those found in tuberculous tissues of cattle; differences that are slight but still definite and constant. The chief of these differences is that what he termed the 'sputum bacillus' is of very low virulence or is non virulent for cattle. In other words, cattle do not become tuberculous when inoculated with that form of tubercle bacillus that is most in consumptive people.*

"The bacillus that is most frequently the cause of tuberculosis in man is now known as the tubercle bacilli of human type and that of cattle as of bovine type.

"Repeated experiments by several investigators have shown that it is possible to take advantage of this difference between the types in accord with the principle of vaccination as discovered by Jenner and developed by Pasteur. Such experiments have been made in Europe by McFadyean, von Behring, Koch and Neufeld and in this country by your speaker in conjunction with Dr. Gilliland. The earliest experiments directly on the immunization of cattle from tuberculosis were those of McFadyean. These experiments were very suggestive and encouraging but they, like the earlier experiments of von Behring, did not constitute a clear trial of the Jenner-Pasteur principle. That is, the experimental animals were treated with chemical substances, as tuberculin, and with tubercle bacilli of different degrees of virulence, some of bovine type, some of the avian type, and not solely with cultures of tubercle bacilli of human type.

"The first experimental work that was published anywhere that showed that it is possible to immunize animals from tuberculosis by treating them solely with tubercle bacilli of human type and that furnished proof of the immunity of such animals by their resistance to inoculation with quantities of virulent tubercle bacilli that produced extensive lesions in unvaccinated animals was recorded in the paper of Pearson and Gilliland in 1902. (Philadelphia Med. Jour. Nov. 2, 1902.) This work represented a development of work that had been going on in the laboratory of the State Livestock Sanitary Board for several years.

"Von Behring was the first to propose a definite method for the practical application of vaccination against tuberculosis. But there is no evidence that the method had been tested when it was proposed and, after a year or so it was abandoned for another method that differed from the first one in some important particulars.

"The State Livestock Sanitary Board recognized the importance of this subject several years ago and authorized experiments on cattle to test its practical applicability. It soon became evident that many cattle would needs be used in such an experiment and that it would be of greatest value if these cattle were kept under practical, farm conditions. This matter was explained to the representative agricultural breeders and veterinary organizations of Pennsylvania and upon their recommendation to the legislature a suitable farm and support have been provided for carrying on this work. The experi-

*While this important fact was firmly established by Smith, later investigations have shown that a considerable percentage of people are infected by precisely the same kind of germ that causes tuberculosis in cattle.

mental herd numbers something more than 100 cattle and consists of cattle that have been vaccinated in various ways, tuberculous cows that associate with the vaccinated animals and that furnish exposure that tests their resistance and unvaccinated cattle that are likewise exposed and that serve to measure the severity of exposure and to furnish a basis for measuring the resistance of the cattle that are vaccinated. The herd is so managed that exposure to infection is practically continuous. The exposure is distributed as equally as possible so that all vaccinated and control animals are exposed to practically the same amount of infective material. This is done by changing the animals from stall to stall in such a way that all are brought into equal association with tuberculous herd mates. The severity of the conditions of exposure is shown by the fact that all of the unvaccinated animals that have been placed in the herd have become infected in some degree, most of them extensively, and some of them have died of tuberculosis acquired from this association. Many methods of vaccination have been tried. The differences have consisted in the use of cultures of different origins and degrees of virulence, of different dosages, varying numbers of doses and of different intervals between doses. The effort has been to gain scientific data of use in formulating a plan for vaccinating cattle at minimum cost and of adequate efficacy. I do not say of maximum efficacy, meaning the production of the highest attainable degree of immunity, because experience shows that it is not necessary to obtain more than a certain amount of resistance to protect against a given set of infective conditions. To secure higher immunity than is needed is to prolong the course of treatment and increase the expense. To make this point clear it should be said that any acquired immunity or resistance to disease is not absolute, it is only relative. An animal vaccinated against any disease may still be caused to die of that disease if it is inoculated with an overwhelming quantity of virus of high virulence. For example, in the West where blackquarter prevails extensively and where it is necessary to vaccinate cattle against this disease, the effort is not to secure the highest possible immunity but only so much resistance as is necessary to protect the young animal from the amount of blackleg virus it is likely to acquire under usual conditions of exposure. It is found that this is accomplished by a single vaccination. If a second vaccination were applied, the second dose being stronger than the first, more resistance would be developed. But, since one vaccination is sufficient, to apply a second would be wasteful. While such animals are protected under their actual conditions of life it is still possible for them to contract blackquarter if they are inoculated with more virus than the amount from which they are protected, the amount that experience teaches they are normally exposed to. There is no utility in developing more resistance than is necessary. 'Enough is plenty.'

"After trying a large number of strains of tubercle bacilli of various types and degrees of virulence we have come to use a culture that was isolated in 1897 from the sputum of a consumptive girl. It is of rather low virulence for guinea pigs, is not virulent for rabbits and has never been known to cause infection in cattle (unless given in enormous dosage to young calves). This organism is grown on veal broth and is made into a suspension by adding a weighed

amount of the culture film to a given quantity of sterile, normal salt solution. The culture film is broken up, so that the tubercle bacilli will not occur in clumps but will be equally distributed through the fluid, by agitating the suspension in a flask with metal balls. It will be seen therefore, that the vaccine consists of living tubercle bacilli of human type floating in normal salt solution. This material is injected into the jugular vein of the calf that is to be vaccinated. After from six to eight weeks a second vaccination is made and after this a third following a like interval. Each dose is larger than that preceding it. No perceptible change occurs in the animal as a result of the first vaccination. The second vaccination usually causes a passing fever, that disappears in a day or two leaving the animal in a normal condition, the fever following the third vaccination is usually even lighter than that following the second. During the process of vaccination and for six weeks thereafter the animal should be protected from exposure. We have not always done this in our experimental work and have had some entirely successful results when this precaution was not observed. But it is considered to be safer to adopt this plan. Six weeks after the third vaccination the animal may be exposed to infection by placing it in infected premises and allowing it to associate with tuberculous animals and it will remain sound. Of course, as has been stated, if the conditions of exposure are excessively severe it may be well to give more immunity by vaccinating a fourth time. But this is not necessary in any fairly well managed herd and if the conditions are above the average for infected herds it is probable that two vaccinations will suffice. We now have some experiments in progress that will throw additional light on this point.

"While it is possible to vaccinate too little, it is also possible to vaccinate too much. That is, if the doses are too large and too frequently repeated the resistance of an animal may be diminished rather than increased, and especially if exposure occurs during or too soon after vaccination.

"The duration of immunity is a most important question and is one upon which data is being gathered slowly. Some of our experiments seem to indicate that the duration is dependent in some degree on the amount of vaccination. For example, two yearlings were vaccinated in exactly the same manner; each received two vaccinations, the last on January 26th, 1904. Both were exposed February 16th 1904. One was killed December 6th, 1904, after $9\frac{3}{4}$ months' exposure and was quite free from tuberculosis. The other was killed December 30th, 1905, after $22\frac{1}{2}$ months' exposure and was found to have comparatively small lesions of tuberculosis in two lymphatic glands, a post pharyngeal and a mesenteric. Two other yearlings in the same experiment was vaccinated three times, they were killed January 21st, 1906 after 22 months of severe exposure and were quite sound. Two unvaccinated cattle exposed with these died of tuberculosis, one after 22 and the other after 23 1-3 months of exposure. Another unvaccinated control was killed after it had been exposed eight months and it was found to be extensively tuberculous, lesions being present in the bronchial and mediastinal lymphatic glands and in the lungs.

"The following case is very interesting on account of the information it furnishes as to the duration of immunity. The animal was a

heifer calf born from a tuberculous cow in the experimental herd. It was vaccinated four times in September, October, November and December 1903. This calf was kept with its tuberculous mother until it was well grown and was also in association with highly tuberculous cattle. She was bred early and calved at about 22 months. She had a second calf 11 months later. During last August, resulting from an attack of cowpox, one teat closed and the milker attempting to open it with a milking tube caused an infection of the udder which resulted in gangrene and death. The postmortem examination showed all of the organs to be free from tuberculosis excepting that in a few of the lymphatic glands of the intestines there were some calcified, healed tubercles, appearing as small stone like masses enclosed in a dense fibrous envelope. There can be little doubt that this cow sustained an infection as a calf, before it was protected by vaccination, and while feeding on the milk of a tuberculous cow, that it fully recovered from this infection, for only the scars remained, and that in spite of rearing two calves before she was three years old and in spite of her constant exposure under conditions that has led to the infection of all unvaccinated cattle and to the death of some, she has proven wholly resistant to tuberculosis three years after vaccination.

"Not one animal that has been vaccinated in accordance with the method that we are now using in practice and that I have outlined has become tuberculous from natural exposure to the disease, nor has an animal been injured by vaccination.

"With such evidence, covering four years and a large number of cattle we have felt that we are amply justified in recommending vaccination and in applying it in practice.

"The State Livestock Sanitary Board is a very conservative body and it has not endeavored to at once launch this new method in wholesale fashion. On the contrary, it is planned to introduce it gradually, using it at first where it is most needed and where the conditions are such as to give it a fair trial. Because the method is new and only those engaged in our experimental work have had experience in handling it, it is for the present applied only by specially trained men from the State laboratory. Cattle have been vaccinated in nearly all parts of the State and the method is having a chance to prove its worth under widely varying conditions. No unexpected or unpleasant results have been observed or reported.

"For the present only young cattle are being vaccinated, calves and heifers to within six months of calving. The reason for this is that the vaccine consists, as has been explained of living tubercle bacilli of human type. It is not known how long these germs will live in the system of the vaccinated animal. As they are not capable of causing infection it is highly probable that they disappear from their bovine host within a short time, within two or three weeks at most, but until there is more positive evidence on this point, it is not deemed justifiable to vaccinate cows in milk or cows that are soon to produce milk. In principle and in practice the process is otherwise as applicable to mature cows as to calves, provided the cattle are tested and are found to be free from tuberculosis before they are vaccinated.

"Some of our experiments show that vaccination has a marked curative tendency on animals already infected. But while it is being

experimented with in this field it would not be fair to hold out the hope that tuberculous cattle may be successfully treated. No doubt many cattle in the earlier stages of tuberculosis may be aided, some may be cured. Where the Bang system for controlling tuberculosis is in use it may be serviceable to vaccinate the infected animals that are probably recently affected for the purpose of prolonging their period of usefulness. But the difficulty is that after the animal has been treated in this way and for a year or more appears to be in perfect health and may have ceased to respond to the tuberculin test, a great deal of fortitude is required to continue to keep that animal in isolation, there develops such a strong tendency to break over the barriers and place it with the sound herd. But to do so would be to take a risk that is not justified in the present state of our knowledge. We can not be certain that the cow is cured until the postmortem examination and, unfortunately, the animal does not lend itself to more than one such examination. So the treatment of tuberculosis of cattle by vaccination is at present an interesting and, I may say, a promising subject for scientific study rather than a practical procedure.

"The study of vaccination is by no means exhausted. There are still many points to be elucidated and the methods are to be still further developed and, I hope, simplified. We have some experiments going that are very suggestive and that encourage this hope, and effort. Of course such work requires considerable time, especially experiments to determine the duration of immunity.

"Already there are different methods in use. A German firm is putting on the market and pushing a dry vaccine that is made by drying tubercle bacilli of human type and then by grinding them slightly. By this process they are weakened. The dry bacilli are taken up in salt solution and injected into the circulation. This is the von Behring method. The comparative experiments that have been made show that this vaccine is not so effective as vaccine prepared by our method. Convincing evidence on this point has been furnished by Hutyra and is published in von Behring's own journal. This is also the conclusion of Koch and Schuetz and is confirmed by others.

"It is quite premature to apply vaccination against tuberculosis promiscuously—to exploit it commercially. In France, Italy and other countries the question is still reserved for scientific study, under government grants (several of which are reported in the September number of the *Revue Generale de Medicine Veterinaire*). Lest the use of vaccination be controlled in some way it is likely to be misused and to lead to disappointment, if not to fraud and to the dissemination of disease. This control should not be left in the hands of a commercial house interested in placing the greatest possible amount of product on the market. As with tuberculin, anthrax vaccine, etc., the character of the product and its proper use should be controlled by appropriate public authority. Pennsylvania has already enacted legislation to prevent the misuse of vaccine and the use of dangerous vaccines.

"Vaccination against tuberculosis is free in this state so far as the resources of the State Livestock Sanitary Board will permit. The process is useful in all breeding herds where there is tuberculosis and by its use sound animals can be produced from tainted ancestry more easily and surely than by the Bang method and their

continued freedom from infection can be insured. Already prospective buyers are inquiring of me as to where they may find vaccinated cattle and this preference is likely to increase and to develop a definite market demand.

"With this new protective method in hand and with other aids that may fairly be said to be in prospect we are steadily gaining ground in our long and difficult fight with this scourge."

THE INSPECTION OF COWS FROM OTHER STATES. Under the provisions of the Act approved May 26, 1897, it is provided that all dairy cows and cattle for breeding purposes from other states shall be tested with tuberculin, at the cost of the shipper. During the past year 28,075 cattle have been tested under the provisions of this Act. About one third of these were tested outside of Pennsylvania and two thirds within the state. The effect of this law has been to lead dealers to exercise more care in the purchase of animals and to discontinue purchasing in localities where tuberculosis is prevalent. It is now required that inspectors of such animals shall make affidavit to their reports. This became necessary because a few inspectors were suspected of falsifying reports. Such conduct was proven in two cases within the State and in three cases outside of the State. Reports are no longer accepted from these individuals. If it is found in the future that false reports are made on these inspections, the inspector will not only be dropped, but he will also be prosecuted for perjury.

DAIRY HERD INSPECTION. A movement of considerable magnitude is now on foot in many states for the improvement of the milk supply of cities. This movement is supported by departments and boards of health, by the medical profession and by the producers of high grade milk. Many proposals have been made, and particularly in New York State, as to the best method for handling this subject. Most of the proposals involve the establishment of sanitary regulations of such high standard as to involve considerable extra expense to dairymen and considerable increase in the cost of milk production. Unfortunately, these plans do not include any provision for a higher price for the milk as sold by the farmer.

It is important that dairymen shall know and realize the extent of this movement. It bids fair, in the near future, to lead to the establishment of additional requirements on milk buyers and vendors. It is important that the whole question shall be very thoroughly studied and that the movement shall be directed in useful and equitable lines so that unnecessary and unfair burdens shall not be placed on the farmer.

Sanitarians will find that milk producers are willing to meet them half way, and that they will take such precautions as are proven to be necessary, so far as is possible in consideration of the price paid by dealers for milk. It is well known that there are some dairy farms that are not equipped or managed in such a way as to produce wholesome milk. The continuance of such conditions is deplored quite as much by milk producers of the better class as by the sanitary authorities of cities. Such undesirable farms tend to diminish confidence in milk and to injure the market and it is decidedly to the business advantage of producers that these bad spots shall be im-

proved. Many unsanitary conditions might easily be remedied, and would be remedied, if attention were called to them, but it is doubtful if the dairy farmers would care to be placed under the supervision of men employed by a city health department, who would go to a farm in the attitude of a policeman hunting for trouble. Such an officer might have little knowledge as to what is practicable or as to conditions under which the dairy farmer should conduct his work. On the other hand, experience shows that visits would be welcome from a representative of the State Livestock Sanitary Board or the State Department of Agriculture, who would go to the farmer not so much in the capacity of an inspector as in that of a friendly adviser, with power to require the observance of necessary sanitary regulations in case of neglect.

It is well that this question shall be studied and sifted by the dairymen themselves so that when legislation along these lines is proposed they will be prepared to work together and to obtain that which will be most useful to the public and to themselves and not be oppressive.

Before cities can, with good grace, ask for improvement in farm conditions they should show whether they are able to discriminate between milk that is good and milk that is bad, that is between clean milk and dirty milk. So long as public institutions and representative hospitals in all parts of the State are willing to accept any kind of milk that is offered them without inquiry as to its sanitary character or its source, and so long as they exhibit no inclination to encourage careful production, the demand of cities for better milk will have to be discounted.

ANIMAL HUSBANDRY. The average quality of farm animals of Pennsylvania is much lower than it should be. There are not enough studs, herds and flocks of pure bred animals. This shows a lack of appreciation of the value of breeding animals of high quality. The high class stock farms that exist in this State show that there is nothing in natural conditions that is antagonistic to such enterprises, on the contrary some of the best animals of all kinds have been, and are, produced in this State, but they are too few in number.

The industries of Pennsylvania draw from other States, and wear out, more horses and mules than are imported by any other State in the Union. It is unfortunate that this great home market is not more largely supplied by home bred animals. There is an impression among horse men (which amounts in most cases to a conviction) that the average quality of the horses bred in Pennsylvania is lower than it was twenty-five or thirty years ago; most of the good horses of all classes are drawn from other States. This is due partly to lack of interest in breeding and partly to the large number of grade and nondescript stallions that are scattered over the State. The State Livestock Breeders' Association has for some years desired the passage of a law to prevent the misrepresentation of the breeding stallions, to provide for the licensing of stallions and to prohibit the use of stallions afflicted with hereditary unsoundness. Such a law was enacted several years ago in Manitoba; it has since been copied extensively by other provinces and States; it has been found

to be a very beneficial provision. It is to be hoped that some such law may be adopted by the next legislature. In case it is adopted, a thoroughly competent man, conversant with and skilled in the principles and practices of horse breeding, should be employed to administer it. Such a representative of the State could render great service to horse breeders and do much to restore this industry to its proper position.

The importation from other states of 20,000 to 30,000 dairy cows annually show the need of and the opportunity for the production of more dairy cattle upon the farms of Pennsylvania. The splendid home market for pork, and for mutton and the large areas available for animal husbandry that are not now in use, or that are not fully utilized, speak for the opportunities that exist here for the development of this important part of the States' resources; and the depleted farms and exhausted fields that may be seen in so many places speak for the need for the invigoration of the soil, that accompanies a thriving animal industry. By means of animals there may be derived from the surface soil of this State an income as great as that derived from coal and that may continue year after year, and century after century, long after the coal fields have become exhausted.

MEAT INSPECTION. The Federal Meat Inspection service has recently been greatly extended, at the instance of the President, and following the disclosures in regard to the unwholesome conditions existing in the packing houses in Chicago. The present Federal Meat Inspection service provides for the inspection of all of the products of slaughter houses and meat canning establishments doing foreign or interstate trade.

No meats, or meat food products are permitted to pass from one State to another without inspection by Federal authorities, excepting the products of animals slaughtered by farmers on farms (which it would be manifestly impossible for the Federal service to cover) and the meats transported interstate by retail dealers supplying their customers.

Under this Federal Meat Inspection service, a few slaughter houses in Pennsylvania are subjected to rigid supervision. These are the large establishments engaged in interstate trade. The products of these establishments, and also the meats coming into Pennsylvania from other states, are, therefore, under careful Federal inspection. But the great mass of slaughter houses of Pennsylvania are not engaged in interstate trade and so do not come under Federal inspection. And at least 55 per cent. of the meats consumed in this State are prepared in such uninspected slaughter houses.

It is evident that there is a large local industry in home dressed meats, an industry that supports a very large number of people and that provides a market for a large number of meat producing animals raised or fattened on farms in Pennsylvania. This is an industry that means a great deal to the agriculture of the State. Without it, the market for meat producing animals would be lessened and the profits of farming would be greatly diminished. Moreover, this local meat slaughtering industry is the only protection we have against unfair prices for dressed meats. If it were not for

this local slaughter business, a combine of packers could regulate the price of dressed meats at will.

Since, under existing conditions, and especially since the passage of the new Federal Meat Inspection law, certain large establishments have the endorsement of the Federal Meat Inspectors' guarantee, these inspected meats have decided advantage in the market at the cost of and to the injury of home dressed meats.

It is evident that the business in home dressed meats will suffer from this competition and that it needs, for its proper development, indeed, for its preservation, the protection and sustaining influence of a State meat inspection service, and the reputation and confidence such a service will give. Such a service will, therefore, be of great economic importance to the live stock and meat producing interests of the Commonwealth.

On the other side, this measure is of great sanitary importance; it has direct bearing on the security of life and health. The officers of the Federal government and Congress and, in fact, the whole people of the United States are so convinced of the sanitary necessity for meat inspection that the Federal appropriation of \$3,000,000.00 a year for this purpose is generally commended. With one twelfth of the population of the United States in Pennsylvania, this means that the Federal government is expending about \$250,000.00 a year for the protection of citizens of this State from the evil effects of unwholesome meats. And the larger part, that is not inspected, is of lower quality and, in general, of more dangerous character than the part that is inspected by the Federal government.

The field is so large that it will be difficult to organize and conduct any State meat inspection service that will be adequate. As the Federal law requires the support of State laws so State laws will need to be supplemented by local regulations and by the establishment of municipal and other local meat inspection service. The function of a State meat inspection service under such conditions would be to coordinate and regulate the local service and to fill in such gaps as might exist between the local and Federal meat inspection. Of course in the beginning of such a movement a great amount of instruction would be necessary as to the principles and practise of inspection and as to the methods for organizing such service and this instruction, example and leadership would come most appropriately from the State.

VETERINARY EDUCATION. As the diseases of animals cannot be effectively controlled without the assistance of trained men, and as the training of such men is in older countries and in many of the states of this country recognized as a public function, it seems to be appropriate to refer to the relation of veterinary education to animal husbandry and to the welfare of the Commonwealth, by adding, as an appendix a paper on this subject that I presented at the last annual meeting of the Pennsylvania State Veterinary Medical Association.

Respectfully submitted,

LEONARD PEARSON,

State Veterinarian.

APPENDIX.

THE VALUE TO THE NATION OF VETERINARY SCHOOLS.

By LEONARD PEARSON, B. S., V. M. D.

A paper read before the Pennsylvania State Veterinary Medical Association, March 7, 1906.

President Elliott has said: "It is a disgrace to organized education that any nation should refuse, as our own people are so apt to do, to learn from the experience of other nations; the schools must have failed to teach history as they should have done."

The American people have been so greatly favored by a virgin, fertile soil, by great natural stores of wealth, by kindly climates and by the absence of a hostile frontier that, as a nation, they have not yet been driven to a severe struggle for existence and to the development of habits and practices of economy, or to a careful husbanding of their resources. The typical American method is that of the miner rather than that of the husbandman. The husbanding of one's estate—husbandry—is in direct contrast with the exhaustion of the rich stores of nature without replacement—mining.

Our great progress as a nation is largely due to the profits derived from turning into cash the bounteous products and stores of nature, the furs, timber, oil, coal, iron and other minerals and, above all, the surplus plant food accumulated and waiting in the soil for the pioneer farmer. These riches, some of which have been gathering thousands of years, and some of which were deposited ages ago, are rapidly being transmuted into fluid capital and some are already well-nigh exhausted. The fur bearing animals are almost gone, the end of our timber resources can be seen in the near distance, the easily available coal and mineral deposits are rapidly diminishing and the limits of the soil areas characterized by surplus fertility are contracting at a startling rate.

The ready minted gold dollars that nature scattered so bountifully and covered so lightly throughout the length and breadth of our country have nearly all been gathered. They were gathered by the lumberman who chopped down and marketed the noble forests of Maine, of Pennsylvania and of Michigan; they were garnered by the tobacco growers and the cotton planters who formerly tilled the virgin fields of the South, many of which are now half exhausted and some of which are barren; they were gathered by the early settlers on the rich and seemingly exhaustless lands of the middle West, where it was possible to grow wheat or corn on the same land year after year, without intermission, for a generation, but where it is now necessary to follow an appropriate rotation of crops and to have a care for the restoration of the elements of fertility; they were gathered by the cattlemen and sheepmen who owned the vast herds and flocks that formerly ranged over the unoccupied lands of the far West, great areas of which have so suffered from exhaustion from over-stocking that they are now practically useless, and the

grasses of some districts are believed to be permanently destroyed. This system of mining natural resources is very different from the art of the husbandman, who makes restoration, in the form of material or tilage, for all that he removes, and under whose skilful hand nature continues permanently to yield her fruits.

All permanent civilization depends on the conserving work of the husbandman. This fact is gaining recognition in our youthful country. The barren, fire-swept, flood-breeding, drouth-encouraging mountain sides are gradually being reforested, the depleted lands of the East and South are being restored to fruitfulness under scientific and conservative systems of agriculture that have been worked out in the experiment stations and agricultural schools. The semi-arid cattle ranges of the West are being cut up into farms which will yield bountifully.

With all of this development, is it not strange that our country continues to tolerate a loss of from \$200,000,000 to \$250,000,000 each year from diseases of animals that ought to be prevented? Why is this loss permitted to continue? Why is this tremendous leak unchecked? In the first place, there has been in this country such an unparalleled amount of natural wealth that, with all of our wastefulness, enough has remained to meet the requirements of our population, and so a continuing loss great enough to seriously incommode, if not to distress, one of the great powers of Europe, has been permitted to go on year after year without hindrance. In the second place, the loss has been so scattered that it has not often fallen with crushing force upon a single locality, although great numbers of individuals have been sadly injured. Thirdly, the veterinary profession has not been sufficiently insistent on the importance and advantages of its work, and so the public has not been strongly enough impressed by the importance of veterinary work to furnish, or to demand from the public treasury, adequate funds for its proper support and development.

Another reason for the tardiness of our development as a profession, and of our institutions, is that on account of our distant position with relation to the old centres of civilization, we have a natural barrier against infections from abroad that has protected us to a large extent from some of the more prominent and striking, the explosive, animal plagues of the old world. Indeed, cattle owners have generally failed to recognize the gravity of the dangers that have actually confronted them until the blow has fallen, as, for example, when contagious pleuro-pneumonia and foot-and-mouth disease have prevailed in this country. Livestock owners were so inclined to accept losses from diseases of animals as a matter of course that they did not organize and demand relief from this source of injury. After contagious pleuro-pneumonia had prevailed in this country for ten years, had been rather extensively distributed, threatening the cattle industry of the United States with the direst calamity, even with partial extermination, as had so recently before occurred in Australia, where it ruined cattle breeding, transforming cattlemen into shepherds; even then the cattlemen made no strong or organized demands for protection until the disease had extended to the West and had reached Chicago, the greatest of our cattle markets. Still the recommendations by veterinarians of the meas-

ures that finally prevailed and that were so brilliantly successful were, in many instances, opposed by the interests to be benefited and so sorely in need of help.

When foot-and-mouth disease appeared in New England a few years ago, the representatives of the cattle industry were more willing to heed the recommendations of veterinarians and the calamity was averted of loss of foreign trade in live animals and of incalculable damage to our domestic animals at home.

These are achievements that are not fully enough discussed and that are not sufficiently appreciated. The saving resulting from the extermination of foot-and-mouth disease alone is great enough to build and endow a veterinary college in every state of the Union and to repay, many fold, all of the funds that have been expended on the work of the Bureau of Animal Industry and the Livestock Sanitary Boards of the various states.

In European countries, where an animal scourge, as rinderpest, occasionally swept across the land, destroying a large proportion of the horned cattle, or almost completely exterminating them, and where other explosive plagues prevailed widely, there has always been both a keen realization of the destructiveness of infectious diseases of animals and appreciation of efforts directed toward the prevention of such diseases.

And so it was, that one of the earliest measures adopted by the governments of Europe for the relief of agriculture and for the improvement of animal husbandry consisted in the establishment of veterinary schools. The veterinary schools antedate the agricultural schools for the reason that the first step in the improvement of animals is to protect them from disease, and agriculture rests largely upon animal husbandry. Some years after schools and laboratories were organized for the development of knowledge concerning diseases of animals, and for its dissemination, agricultural schools came into being.

This country has been very tardy in its recognition of the importance of the veterinary sciences, being, in this respect, more than eighty years behind Germany, France, and the lesser countries of continental Europe. Perhaps a reason for the slow development of state veterinary schools, in spite of the great need of the country for the work of such schools, may be found in the unprecedented development of schools of agriculture and of agricultural experiment stations. Institutions of these classes were organized in every state, and the impression seems to have prevailed that it would be possible for them to take care of the needs of the country with respect to veterinary development and teaching. This, however, has not been the case, and it has long been clearly evident that veterinary teaching, if it is to amount to anything in a serious and definitely useful way, and if it is to be developed to a point at all compatible with the needs of the country, must have its own separate and specially equipped institutions. The work of the agricultural colleges and experiment stations has developed so much faster than the income of these institutions that those responsible for their management are constantly appealing at Washington and at the various state capitals for increased revenue. Thus the veterinary sciences have remained in the background, undeveloped and unable to exert their

beneficial influences for the protection and betterment of animal husbandry.

Quite recently a change of sentiment has become apparent and veterinary work is beginning to have public recognition. It is now time to make known the advantages that will accrue to the state from the proper development of veterinary research, veterinary education and veterinary administration. The limited public veterinary work that has been authorized, has proved its value and serves as a strong argument for further development.

It is probable that in the more civilized countries, great outbreaks of rinderpest, foot-and-mouth disease, contagious pleuro-pneumonia, etc., etc., are as unlikely to occur as are great outbreaks of the plague or cholera under our modern conditions. New conditions develop or, at any rate, encourage new diseases. The destructive infectious diseases of today are more chronic and more widely distributed than the great plagues of former times. The diseases of today destroy more animals, but the victims are scattered. Instead of destroying half of the cattle within a limited area, they may destroy 5 per cent. of the cattle in a district a hundred times as great, or, the victims may be gravely injured and rendered unprofitable but not killed. Animal plagues in these days are not so explosive as they are erosive. Tuberculosis, abortion, and calf cholera were never before so prevalent as they are today. On account of their insidious nature they do not cause the alarm, but they do cause as much loss as some of the more spectacular and rapidly spreading maladies. Besides this, there are the various infectious diseases of horses: glanders, infectious pneumonia, influenza, strangles, tetanus, purpura hæmorrhagica, also various forage poisonings, and osteoporosis. In addition, there are numerous infectious and parasitic diseases of other animals and there are important veterinary problems in connection with breeding and animal production, all of which require elucidation. The veterinarian is not only a physician for animals—he is an animal engineer. Moreover, the work of the veterinarian is of importance with relation to the supervision of the production of foods of animal origin.

I have referred only to such veterinary work as is of immediate public importance, but surely it is also of importance that owners of valuable animals may be able to obtain the services of skilled men to furnish advice as to the prevention of disease and to treat ailing animals, so that, so far as possible, their sufferings may be relieved and they may be restored to usefulness.

It is necessary only to turn to the experiences of other countries to learn that a large part of our great and continuing losses from animal diseases is avoidable, and is a result of neglect.

The veterinary development of Denmark furnishes a very instructive lesson. Denmark is a small bleak country, and a generation ago it found itself stripped of its fairest province, impoverished by war and confronted by changed economic conditions that made it impossible for it to continue the kind of husbandry (grain production) that had formerly sustained it. The indomitable will and resourcefulness of the people brought about a complete change in the agricultural conditions, under which dairying became the chief industry. This brought into great prominence the importance of animal

hygiene. The old veterinary school of Copenhagen, established in 1773, had long before laid the foundation for a substantial veterinary development. Through the influence of the men trained in this school, one infectious disease after another was exterminated or brought under control until, at this time, there is no other country in the world with such a large animal population, in proportion to its area, where the animals are as healthy, as productive and as profitable as in Denmark. The Danish work in the development of the means of control of tuberculosis, abortion, calf cholera and milk fever has brought to the veterinarians of that country world-wide fame. The present prosperity of the people of Denmark rests on animal husbandry and is due in a very large degree, to the work of the veterinarians. One discovery by a Danish veterinarian, a cure for milk fever, has already, in the course of five years, been the means of saving to owners of cows throughout the world a sum sufficient to equal all of the money that has been expended on the construction, equipment and maintenance of all veterinary schools established since the first one, at Lyons, in 1762.

Belgium is the most thickly populated country in Europe, but, notwithstanding this, it has an extensive and highly developed livestock industry. In draft horse breeding, Belgium has taken particularly high rank, and the farms yield astonishing quantities of dairy products. This would not be possible if the health of the domestic animals were not carefully and successfully guarded. The quality of the service rendered by the veterinary profession of Belgium and the public appreciation that this work has received are shown by the fact that the veterinary school in Brussels, founded in 1832, is now being re-equipped with a group of nine schools, laboratory and hospital buildings, beautifully placed on large, park-like grounds, at cost of about 6,000,000 francs.

In Germany, there is a veterinary system that has been developing since 1778, when the first German veterinary school was established in Hanover. Other schools have been established until there are now six, all well equipped and adequately supported. The German organization for administering the veterinary laws is interesting because it shows the results of a natural development in accordance with the needs of the situation; the development being guided by a well-trained profession. The central administration of veterinary laws in Prussia, for example, is in the branch of government presided over by the Minister of Agriculture. The Minister of Agriculture is advised in all technical veterinary subjects by a board of veterinarians. All rules and regulations for the control of diseases of animals and for the guidance of official veterinarians are made by this Board. The Board also subjects to a written, a practical and an oral examination all candidates for appointment to the positions of department or district veterinarian. In each local district there is an official veterinarian known as the *Kreistierarzt*, whose duty it is to exercise local supervision with regard to infectious diseases of animals, to advise and encourage breeders, to supervise horse-shoeing, to enforce quarantine laws, and, in general, to look out for and to improve the health, quality and usefulness of the domestic animals of the district. The Department Veterinarian has somewhat larger jurisdiction; his field includes many local districts. The de-

partment and district veterinarians are subject to regulations from the Minister of Agriculture and from the chief executive officers of the departments and districts.

The result of this arrangement has been to bring the whole of Germany under such veterinary supervision as to lead to the great restriction of infectious diseases and greatly to improve the livestock industry. This benefit to the country is reflected in the adequate generous support of the veterinary schools, for it is clear to every one who has looked into the subject that the real value and the permanence of the system must depend on the schools.

It would not make the case stronger to go on and to pile up example upon example of the public advantages from veterinary work or to show that a country cannot reap these advantages without fostering the development of the veterinary sciences.

Surely, it should be possible for our country to learn this lesson from the experience of other countries. The leading facts are that the losses from preventable disease of animals are great, and they are avoidable. Why continue to suffer them? Let us profit by the experience of others.

REPORT OF ECONOMIC ZOOLOGIST.

HARRISBURG, PA., *January 1, 1907.*

Hon. N. B. Critchfield, *Secretary of Agriculture, Harrisburg, Pa.:*

Sir: I have the honor to submit to you the Annual Report of the Division of Zoology for the year 1906.

As originally announced in our Monthly Bulletin in 1903, Vol. 1, No. 1, the work of this office is chiefly comprised under the following heads:

1. Examining Specimens and Answering Inquiries.
2. Personal Work: Investigations and Experimentations.
3. Publications.
4. Lectures.
5. Inspections of Nurseries and Private Premises.
6. Inspections of Imported Plants, Seeds, and Fruits.
7. Making Collections.

To this should now be added one more:

8. Demonstrations of Methods of Combatting Pests.

1. EXAMINING SPECIMENS AND ANSWERING INQUIRIES.

During the past year we have made more additions to our collections than ever before. This is chiefly because many of the office employes have been making collections, especially during their brief hours of recreation, and partly because the public is taking more interest in the work of this office and sending us many specimens with inquiries concerning them. Donations of specimens, large and small have been contributed, and these have been acknowledged by mail and recognized in our Monthly Bulletins. Such collections have been of very great value to us in aiding to procure representations of various forms of life that may be found in this State. We are rapidly putting them into the best shape for study, but in this connection we should call attention to the fact that more help is needed in this important work of preparing collections of beneficial and obnoxious insects of this State. During the year 1906 there were three thousand five hundred and eighty (3580) collections made and recorded in this office, many of which contained thousands of specimens, and consequently it can be seen that the number of individual specimens added to our collections is almost incredible in number. The collection is growing rapidly from nothing whatever, three and a half years ago, to one which must today be considered as worthy of a place in the accurately prepared and scientific collections of the world. In few collections have the records ever been so complete, the data so full, the records so carefully and systematically kept, or the specimens so well preserved.

I wish to take this opportunity to call attention to the care with which the specimens, especially the insects, are preserved by the assistants who have helped with this work, especially such men as

Messrs. A. F. Satterthwait, W. S. Fisher, D. K. McMillan, W. R. Walton, P. H. Hertzog, W. R. McConnell, H. O. Marsh, and Paul R. Myers, besides a few other persons who have come into more or less occasional contact with them. Of course, it must not be understood that all the persons here named have worked exclusively, or even during a great portion of their time, at making or preserving collections, but they worked for what brief time they could give to this, as for example, when it was stormy and they must be indoors, with such care that experts who have seen even our most delicate specimens have pronounced them the best prepared and preserved of any that have come into their hands. Of course, such work and results are essential if our collection is to be a permanent basis for the study of Natural History in this State. I only regret that arrangements have not been made for us to come into more direct touch with the State Museum in order to help develop that Institution and to use its facilities for storage and exhibition purposes.

One of the great uses of this collection is now making itself manifest in the extensive calls from Granges and other permanent organizations, which have regular meeting rooms, asking us to furnish them collections of beneficial and obnoxious insects for exhibition and study in their rooms. Teachers, by the hundreds, have also applied to us for collections, as well as for naming and classifying specimens in their own collections in order to use these correctly named specimens for comparison in naming others. I hope it will be possible to furnish at least one carefully prepared and labeled collection of insects, and in fact of all animal organisms found in this State, for one of the prominent public schools in each county, or, perhaps, to arrange a systematic or travelling collection, somewhat upon the plan of the traveling libraries, to be used by teachers who desire them as aids in Nature Study work. Another employee, acting in the capacity of Curator, would make this possible, and we deem it sufficiently important to urge it for both educational and practical purposes.

2. INVESTIGATIONS.

As previously reported the investigations of this office have been chiefly along the line of Economic Zoology with most reference to destructive insects, but with due regard to beneficial insects, and at least some attention to the enemies of our common insect pests. We have continued the investigations upon the subject of San José scale and its enemies and remedies, and have proven conclusively the truth of our former statement to the effect that "the lime-sulphur wash, boiled for one hour, and applied while the leaves are off the trees, or when the trees are dormant is the best means of killing the San José scale, the safest or least injurious to the infested trees, and the least expensive material that can be effectively applied for this pest." (See Report for 1905, page 130.)

The various Experiment Station Bulletins confirm this in every point, and quite recent bulletins coming into our hands show the most careful experimentors are in accord with this.

Tests have been made with various commercial materials for killing the San José scale, and as a general result we have found that most of them are not very good, but the so-called miscible oils or soluble oils, sold under various trade names are good insecticides

when used at the proper strength. Unfortunately, the manufacturers and agents are claiming that these preparations can be used one part of the oil to twenty parts of water, when the trees are dormant, to kill the San José scale, when our experiments have proven that the right proportion for proper results must be one part of the oil to twelve of water.

Our experiments with cut worms have proven that they can be poisoned with poison bran mash, and we have published extensively in our Bulletins upon this subject. (Vol. III., pp. 356 and 367-369.)

As most of the results of our original investigations and experiments have been published in our Monthly Bulletins, or will be so published, it is not necessary to give them in detail here, but cite from such references as follows: "Preliminary Report of Fall and Winter Experiments with Commercial Insecticides," January Bulletin, pp. 272 to 274; "Experiments with Homemade Insecticides for San José Scale," March Bulletin, pages 335 to 341; "Tests of Commercial Insecticides," pages 342 to 344, March Bulletin; "Experiments with Cutworms on Strawberry Plants," April Bulletin, pages 367 to 369; "Experiments with the Asparagus Beetle," May Bulletin, pages 6 to 9; "Summer Experiments for Scale Insects," June Bulletin, pages 45 to 48; "Summer Experiments for the Oyster-shell Scale," July Bulletin, pages 83 to 84; "Summer Treatment of Scale Insects," Bulletin for July, pages 84 to 88; "Economic Features of the Serpents of Pennsylvania," August and September Bulletins, and "San José Scale Experiments," November Bulletin, 1906.

We are continuing investigations along those features of insect life that are not well known, and making a special study of parasites and larger enemies of insect pests. Among our investigations now going forward, and which we are not ready to publish in detail, are the following:

"A Study of the Enemies of the Chestnut," "The Enemies of the Locust Tree," "The Insect Pests of Hay and Forage Plants," "Scale Insects and Other Fruit Pests," "Insects attacking Weeds," "The Turtles and Lizards of Pennsylvania," and "Pennsylvanian Amphibians."

The subject of insects injurious to weeds is one of direct importance in destroying certain weed pests, and may become of great importance otherwise, as we know that many of these pests, are able to transfer their attacks from weeds to cultivated crops, and thus at once become very destructive. This means that if such pests be left to multiply upon weeds, they are liable to make this manifest by outbreaks upon cultivated plants, and as a consequence the best means of holding them in check is to practice such clean farming as to destroy all weeds they inhabit. Specifically, among such pests are the stalk borers, which feed in the stems of many weeds, but also in many cultivated plants, especially tomato and potato, and also the plant lice, which attack the roots of many kinds of weeds, but also may be very injurious to corn in the spring of the year.

Experiments are being continued to discover more simple remedies for the older and better known insects, to test new materials as they are recommended in certain parts of the earth from time to time, and especially to give fair tests to the commercial insecticides as they appear on the market with advertised but too often misleading recommendations of their virtues.

The tests of commercial insecticides are of very great importance to the citizens of this State. We take pleasure in stating that this office has been instrumental in showing the evils or inefficiency of at least three commercial insecticides, two of which were withdrawn from the market during the past year. One of these was sold under the trade name of "Con-Sol," and was very widely advertised, but after our tests proved its worthlessness, we did not hesitate to make announcements to that effect. We had considerable correspondence from the manufacturers and read their urgent claims that their preparation would do the work they claimed for it. Even after our being obliged to incur the displeasure of some agricultural papers by protesting against the advertisement of such fraudulent materials, it was finally proven that "Con-Sol" was worthless as a destroyer of scale insects, and during the past year the manufacturers finally acknowledged this, withdrew all advertisements from the papers, and withdrew the substance from the market. They are now making an entirely different material, which gives promise of being a fairly good commercial insecticide when used at sufficient strength.

A second material, which we showed to be an imposition upon the fruit growers and helped to force from the market, was made and sold at Waynesboro, Pa., under the name of "Sea-Kill." We had this analyzed, and found it to consist of sulphur, resin and gun powder. It was to be applied by boring holes in the tree and inserting this in the tree, and plugging them. Common sense taught us that the sap of the trees would not take up such things but to be sure to do no injustice to the makers and advertisers, we tested this material thoroughly, after having obtained some of it by strategy, as the manufacturers would send none to us, even though we offered to pay for it. Our tests, as well as the practical application of some of it in some rather extensive orchards in this State, proved the material to be useless as an insecticide, and the public was at once informed of this fact. The material has had an extensive sale at \$1.00 per pound, not only in this State, but also in several other States of the Union. It is now announced for the benefit of fruit growers in this State that this substance also has been withdrawn from the market, and all advertisements of it are canceled and withdrawn. This has been done after severe protest and threats of the manufacturers, who now realize that materials that are not meritorious can not stand a prolonged practical test nor the honest scrutiny of the people.

We believe that our new experiments are resulting in giving satisfactory and definite information in controlling Peach-tree Borers, Borers of Apple and Pear tree, Peach Rot, Grape Pests and Disease, Cabbage Pests and other insects and plant diseases for which more or less experiments have been made. The older or previous experiments gave us valuable and practical results in remedies for the San José Scale and other Scale insects, Currant Worms, Cut Worms, etc.

Of course, the most important insect pest in this State in regard to fruit production is the San José Scale, and as our investigations and experiments have been directed mostly toward that, we are prepared to announce with certainty that the best and cheapest

means of controlling it is the boiled lime-sulphur wash, applied in two thorough coats or sprays shortly before the buds burst in the spring. This is fully discussed in our Bulletins for November, December and February.

3. PUBLICATIONS.

The publications of this office have consisted of the Monthly Bulletins of the Division of Zoology, which have been issued regularly each month, an Annual Report, illustrated Address on Bee-Keeping, delivered at the Clearfield Meeting of Farmers' Institute Workers, a Bulletin on Bee-Keeping, being the First Annual Report of the State Bee-Keepers' Association, Addresses in the Publication of the State Horticultural Association occasional Circulars and several Newspaper Articles.

Of course, our chief means of publications has been brought through the Monthly Bulletin of this Division. The prime object of this Bulletin has been to give farmers a timely publication concerning pests and items of interest and importance concerning their crops or work for the particular month of each respective issue. By issuing the Monthly Bulletin regularly and periodically we have been able to save a great amount of postage, for the reason that this has given us a second class rate, and the postage on these Bulletins can be paid by the pound, whereas if they were issued at irregular intervals, each copy mailed to any individual could go only by bearing its own postage stamp.

The Quarterly Bulletin was discontinued for the sake of economy, last year, with the issue of May Bulletin, No. 1 of Volume III., but the subjects treated in the Quarterly Bulletins, viz., the Economic Features of Pennsylvanian Vertebrates, have been continued in occasional issues of the Monthly Bulletin.

In these Monthly Bulletins are contained not only timely articles on insects, zoology, farm operations, plant diseases, etc., but also the results of our investigations and experiments, and formulæ for insecticides and fungicides. A regular system has been followed. For example, the May number is devoted to a condensed series of Formulæ; the June number to Insects and Plant Diseases infesting most cultivated trees and shrubs; the July number to Scale Insects, Plant Lice and other summer pests; the August-September number to some feature of Vertebrate Zoology; the October number to Fall Pests of the Farm; the November number to the San José Scale, with special reference to Winter Remedies; the December number to some educational subject in Zoology; the January number to Nursery and Orchard Inspection; the February number to Spring Remedies for the San José Scale and the March and April numbers to spring and Summer Pests and General Zoology.

The most unique publication that we have issued has been our August-September Bulletin for 1906, which was on "The Serpents of Pennsylvania." This Bulletin contained more facts concerning the habits and food of our native serpents than has ever before been put into print, and no less an authority than Dr. Stejneger, the herpetologist of the U. S. National Museum, has said that this is the only publication in the world upon the food and economic features of such creatures. It was certainly received most cordially

by the citizens of this State, and others who applied for it, to such an extent that our issue of twenty-five thousand was soon entirely exhausted, and yet more calls for it continue to come at the rate of several per day. No publication previously issued from this office has created such interest and met with such popular endorsement, and none has been so much in demand.

A most important series of articles was commenced in our Bulletin for January last, as "A General Systematic Study of Insects." In this series of articles we take up the structural characters of the different orders and families of insects, briefly describing their special characteristics, and also discussing their effects, food plants and remedies or preventives. Of the nineteen orders of insects we published in the January Bulletin on the first to ninth inclusive, and in the June Bulletin on a portion of the tenth or the Sub-order Heteroptera of the Order Hemiptera. The second sub-order of the Hemiptera or Bugs will be discussed in our August Bulletin for the coming year.

I earnestly recommend legislative authority to increase the number of our Bulletins, for the reason that hundreds of persons have applied for them who can not receive them when the number is limited to twenty-five thousand, which is the legal limit and is covered by our present mailing list.

4. LECTURES.

Our public lectures for the past year have been confined mostly to Annual Meetings of Societies more or less connected with some branch of Agriculture, and prominent meetings of Granges, the State Farmers' Institute, State Horticultural Association, State Bee-Keepers' Association, etc. We have had many requests to attend agricultural meetings of various kinds and deliver lectures, but could not find time to accept most of them. Our field demonstrators in their demonstration meetings, have lectured upon the San José Scale and similar pests, and have reached thousands of persons in a practical way by so doing.

INSPECTION OF NURSERIES AND ORCHARDS.

The nurseries of this State were inspected in August and again in February, to be sure that the San José Scale would not be disseminated upon either the fall or spring shipments of trees. This was the first time in this State that the winter or February inspection of nurseries had been made, and we find it to be fully justifiable. Scale was found in a few nurseries where it had not been previously located, and some premises on which it was supposed to have been destroyed were found yet to be slightly infested. By the aid of this office the dissemination of the San José Scale on nursery stock has been very materially decreased. The biennial inspection of nurseries should continue, and according to our present plans will be practiced during another year. The following nurseries have been inspected and have complied with the requirements of the law in this State. They are consequently given certificates for selling their stock:

Adams County.

Name.	Place.	Acres.
R. M. Elden,	Aspers,	3
C. A. Stoner,	Gettysburg,	3
Cornelius Bender,	Idaville,	1
E. W. Yengst, R. D. No. 1,	Idaville,	$\frac{1}{2}$
H. W. Sowers,	Latimore,	$1\frac{1}{2}$
Charles J. Wilson,	Mummasburg,	3
W. E. Grove,	York Springs,	10
H. R. Plank,	York Springs,	3

Allegheny County.

J. B. Murdoch & Co.,	Pittsburg,	2
Elliot Nursery Co.,	Springdale,	33
G. R. Elliot,	Westview,	1
Mark E. Head,	Bellevue,	$\frac{1}{2}$
John W. Jorden,	Millvale,	$\frac{1}{2}$

Beaver County.

Mackall Bros.,	Beaver,	20
*James Smith,	Beaver Falls,	6
A. P. Goodwin,	Industry,	12
*J. Hoyt,	Industry,	15
*Henry Finley,	Industry,	4
*A. J. Freed,	Homewood,	10
*Fred A. Russell,	Industry,	$\frac{1}{2}$
*W. A. Freed,	Homewood,	5
*Joseph and Charles Engle, R. D. No. 1,	Beaver,	12
*Arnold Bros., R. D. No. 2,	Beaver Falls,	9

Bedford County.

Austin Wright,	Alum Bank,	2
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Berks County.

Wenrich Bros.,	Robesonia,	$\frac{1}{2}$
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Blair County.

F. A. Bowser,	Newry,	$\frac{1}{4}$
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Bucks County.

J. L. Lovett,	Emille,	10
Somerton Nurseries, 125 S. 15th St., Phila., A. U. Bannard, Mgr.,	Somerton,	20
Henry Palmer,	Langhorne,	4
Horace Janney,	Newton,	5
D. Landerth Seed Co.,	Bristol,	5
The W. H. Moon Co.,	Morrisville,	200
S. C. Moon Co.,	Morrisville,	50
J. G. Youngken,	Richlandtown,	1
S. R. Trach, R. F. D. No. 1,	Springtown,	1

Butler County.

Pieree Bros.,	Butler,	10
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Chester County.

George Achelis,	West Chester,	200
The Conard & Jones Co.,	West Grove,	30
The Dingee & Conard Co.,	West Grove,	30
Rakestraw & Pyle,	Kennett Square,	200
J. A. Roberts,	Malvern,	16
Hoopes Bros. & Thomas,	West Chester,	600
J. B. Reif,	Spring City,	2
Benj. Connell,	West Grove,	4
E. B. Keating,	Kennett Square,	$1\frac{1}{2}$

*Grow berry or small fruit plants only.

Clearfield County.

Name.	Place.	Acres.
W. S. Wright,	Clearfield,	$\frac{1}{2}$

Crawford County.

*M. N. Shepard,	Cochrannton,	$\frac{1}{2}$
*Anderson Bailey, R. D. No. 66,	Cochrannton,	12
*Lee Bailey, R. D. No. 66,	Cochrannton,	$\frac{1}{2}$
*Henry Roberts, R. D. No. 66,	Cochrannton,	4
*J. T. Reed, R. D. No. 66,	Cochrannton,	2
*David Kelty, R. D. No. 66,	Cochrannton,	1
*Park Bailey,	Cochrannton,	3
*Samuel J. Cooper,	Cochrannton,	4
*W. H. Braymer,	Cochrannton,	1
*Lewis Swegger, R. D. No. 33,	Carlton,	2
C. L. Unger, R. D. No. 11,	Meadville,	3
Prudential Orchard Co.,	Shermansville,	25
*A. L. Bossard,	Geneva,	1
*J. Q. Marsh,	Geneva,	2
*Wm. Wood,	Geneva,	1
*Frank Smock,	Geneva,	1
*L. L. Wood,	Geneva,	2
*H. C. Carroll,	Geneva,	1
*Robert Bennett,	Atlantic,	3
*Peter Schaffner, R. D. No. 2,	Meadville,	$1\frac{1}{2}$
*James T. Irwin,	Cochrannton,	$1\frac{1}{2}$
*Samuel Bailey, R. D. No. 66,	Cochrannton,	1
Atkin & Hall, R. D. No. 41,	Linesville,	$2\frac{1}{2}$

Dauphin County.

C. P. Scholl, R. D. No. 1,	Halifax,	6
Snavely & Trombine,	Progress,	3
J. M. Christman,	Fort Hunter,	$\frac{1}{8}$
Andrew Coble, R. D. No. 1,	Middletown,	$2\frac{1}{2}$

Delaware County.

P. Z. Supplee,	Collingdale, ..	25
J. J. Styer,	Concordville, ..	2
M. F. Hannum,	Concordville, ..	1
W. E. Caum (Lessee),	Haverford,	4
John G. Gardner,	Villa Nova,	5
Wayne Iron Works,	St. Davids,	5
Joseph H. Brinton,	Camp Ground,	$\frac{1}{2}$

Erie County.

*A. F. Youngs,	North East,	4
*Orton Bros.,	North East,	5
L. G. Youngs,	North East,	20
*D. C. Bostwick & Son,	Ripley, N. Y.,	9
*M. E. Kelley,	North East,	4
*A. J. Youngs,	North East,	4
*W. E. Smith,	North East,	3
Emil Laurent,	Girard,	2

Fayette County.

J. Sterling & Son,	Masontown,	10
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Franklin County.

J. W. Zook,	Chambersburg,	$\frac{1}{2}$
Geo. H. Weit (Forester),	Mt. Alto,	1
Henry Eicholz,	Waynesburg,	1
W. B. Reed,	Chambersburg,	$\frac{1}{4}$

Fulton County.

Eli Covalt,	Covalt,	1
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*Grow berry or small fruit plants only.

Juniata County.

Name.	Place.	Acres.
*Elmer W. Graybill,	Richfield,	2
Jos. H. Landis,	McCullough's Mills,	3
*Augustus Frantz,	Richfield,	1
*S. H. Graybill,	Richfield,	5

Lackawanna County.

*George H. Colvin,	Dalton,	2
*Floyd H. Northup,	Glenburn,	2
John W. Shepherd,	Scranton,	4
*H. H. Northup,	Dalton,	$\frac{1}{4}$

Lancaster County.

John G. Engle,	Marietta,	6
A. H. Erb,	Lititz,	$\frac{1}{2}$
Maurice Brinton,	Christiana,	20
W. P. Bolton,	Bonview,	2
D. D. Herr,	Lancaster,	5
H. H. Harnish,	Hubers,	2
Wilson Kready,	Mt. Joy,	1
Calvin Cooper,	Bird-in-hand,	2
O. W. Laushey,	Bird-in-hand,	2
A. W. Root & Bro., R. D. No. 1,	Manheim,	20
David S. Herr,	Mountville,	2
M. H. Musser,	Lancaster,	2
M. A. Kolp,	Elizabethtown,	1
B. F. Barr & Co.,	Lancaster,	3
Frank A. Suter,	Lancaster,	$\frac{1}{2}$

Lawrence County.

J. W. Hayes, R. D. No. 3,	Edinburg,	1
Butz Bros.,	New Castle,	1
A. S. Moore,	New Castle,	2
D. W. Fisher,	New Wilmington,	1
*Jas. R. Seley,	New Wilmington,	$\frac{1}{4}$
*Hover Bros., R. D. No. 63,	New Wilmington,	2

Lehigh County.

W. B. K. Johnson,	Allentown,	30
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Luzerne County.

I. A. Driggs,	White Haven,	
(Handles only native ornamental shrubs.)		
M. A. Maffett,	Wilkes-Barre,	1

Lycoming County.

Evenden Bros.,	Williamsport,	2
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Mercer County.

*George E. Brocklehurst, R. D. No. 20, Jackson Centre,		2 $\frac{1}{2}$
*Benj. S. Anderson,	Stoneboro,	2
*J. E. Brocklehurst, R. D. No. 3,	Mercer,	1 $\frac{1}{2}$
*J. W. & J. H. Allison, R. D. No. 10,	Mercer,	10
*Mrs. Gust. Engstrom,	Stoneboro,	1 $\frac{1}{2}$
*Harris W. Frost, R. D. No. 20,	Jackson Centre,	$\frac{1}{2}$
*H. A. McClaren,	Stoneboro,	2
*Wm. Doyle,	Stoneboro,	4 $\frac{1}{2}$
*G. W. Proud,	Stoneboro,	$\frac{1}{2}$
*Olaf Henson,	Stoneboro,	1
*Jacob Froman, R. D. No. 22,	Stoneboro,	1
*Wm. Turner,	Stoneboro,	4 $\frac{1}{2}$

*Grow berry or small fruit plants only.

Name.	Place.	Acres.
*Robert Doyle,	Stoneboro,	1
*Duncan McClaren,	Stoneboro,	1½
*J. T. McLean, R. D. No. 46,	Greenville,	4
*Hugh Hogan, R. D. No. 28,	Carlton,	2½
J. L. Hoobler & Sons, R. D. No. 34,	Hadley,	4
*W. A. Taylor, R. D. No. 34,	Hadley,	4
*W. R. Cribbs,	Mercer,	3
*H. W. Allison, R. D. No. 9,	Mercer,	2

Montgomery County.

Chris Koehler,	Cheltenham,	2
R. B. Haines & Co.,	Cheltenham,	10
C. H. Wilson,	Gladwyne,	2
J. B. Heckler,	Lansdale,	4
J. W. Thomas & Sons,	King of Prussia,	70
J. Krewson & Sons,	Cheltenham,	15
T. N. Yates & Co.,	North Wales,	100
J. B. Moore,	Hatfield,	10
Adolph Mueller,	Hoyt,	40
T. Meehan & Sons, Inc.,	Dreshertown,	200
Wm. Sturtzbecker,	Lansdale,	½
Edward D. Droun,	Weldon,	¼

Northampton County.

Theodore Roth,	Nazareth,	2
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Northumberland County

Joseph Harris,	Shamokin,	¼
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Perry County.

Geo. A. Wagner,	Alinda,	5
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Philadelphia County.

W. W. Harper,	Chestnut Hill,	500
Thos. Meehan & Son, Inc.,	Germantown,	75
T. N. Yates & Co.,	Germantown,	4
John B. Lewis,	Bustleton,	10
A. F. O'Connell,	Philadelphia,	10
John Stephenson's Son,	Oak Lane,	2

Somerset County.

Village Nurseries,	Harnedsville,	37
H. E. Daniels,	Harnedsville,	7

Susquehanna County.

*E. A. Smith,	Heart Lake,	4
*Geo. Sprout,	Montrose,	5
*B. D. Hinds,	Montrose,	2
*E. D. Snyder, R. D. No. 1,	Hopbottom,	1

Venango County.

Venango Nursery Co., R. D. No. 1,	Franklin,	6
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Westmoreland County.

John McAdams,	Mt. Pleasant,	2
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Wyoming County.

*W. H. Swartwood,	Square Top,	5
*Silas Decker,	Square Top,	5
*F. H. Fassett,	Meshoppen,	1

York County.

Name.	Place.	Acres.
Patterson Nursery Co.,	Stewartstown,	12
Geo. E. Stein,	East Prospect,	6
W. S. Newcomer,	Glenrock,	4
E. J. Weiser, R. D. No. 11,	York,	$\frac{1}{2}$

It has been found desirable to oblige tree dealers to obtain certificates in order to transact their business in this State, and at the same time suppress the dissemination of the San José Scale and other pests. The source of the stock of any tree dealer is made the subject of inquiry by this office, and those dealers who are selling certified stock, whether grown in this State or in other states, are given certificates to operate in this Commonwealth. The following is a list of tree-dealers holding certificates:

ADAMS COUNTY.

R. E. Allen, Aspers, Pa.

ALLEGHENY COUNTY.

W. B. Bockstose, Castle Shannon, Pa.
 L. F. Miller, 1023 Garret St., Pittsburg, Pa.
 E. C. Hauser, Bellevue, Pa.
 Charles Honess, Allegheny, Pa.

BEAVER COUNTY.

J. C. Withrow, Vanport, Pa.
 A. E. Crouch, Rochester, Pa.
 J. H. Gutermuth, Rochester, Pa.

BEDFORD COUNTY.

J. W. Myers, Everett, Pa.

BERKS COUNTY.

L. M. Neischwender, Hamburg, Pa.
 Jacob H. Weand, Reading, Pa.
 M. E. Smeltzer, Reading, Pa.
 Alfred Dreibelbis, Reading, Pa.

BLAIR COUNTY.

James Hopkins, Juniata, Pa.

BRADFORD COUNTY.

J. F. Gable, Athens, Pa.
 Jos. E. Hamilton, R. D. No. 16, Rome, Pa.
 J. P. Sibley, R. D. No. 16, Rome, Pa.

BUCKS COUNTY.

A. P. Kratz, Silver Dale, Pa.

BUTLER COUNTY.

Geo. W. Haine, R. D. No. 32, Callery, Pa.

CARBON COUNTY.

Paul Neihoff, Lehighton, Pa.
 David N. Rehr, Lehighton, Pa.
 L. D. Wagner, Weissport, Pa.

CHESTER COUNTY.

John Alcorn, Malvern, Pa.

CLINTON COUNTY.

W. W. Richie, Lock Haven, Pa.

CRAWFORD COUNTY.

J. C. Boyd, Guy's Mills, Pa.
A. B. Greenfield & Son, Conneautville, Pa.
G. G. Fish, Conneautville, Pa.
F. M. Fleming, Cochranton, Pa.

CUMBERLAND COUNTY.

Ira. E. Bigler, Camp Hill, Pa.
D. C. Rupp, Shirmanstown, Pa.
Towzer & Wolff, Carlisle, Pa.

DAUPHIN COUNTY.

A. H. Shreiner, Harrisburg, Pa.
T. A. Woods, Harrisburg, Pa.
Geo. F. Greenawalt, Hummelstown, Pa.
Gilbert Troutman, Millersburg, Pa.

DELAWARE COUNTY.

John Wetherill, Chester, Pa.

ERIE COUNTY.

W. S. Waldo, North East, Pa.
E. E. Carr, North East, Pa.
W. C. Batchelor, Erie, Pa.

LACKAWANNA COUNTY.

Giles L. Clark, Scranton, Pa.
A. J. Noble, Scranton, Pa.

LEBANON COUNTY.

Samuel P. Moyer, Myerstown, Pa.

LEHIGH COUNTY.

N. C. Beachy, Allentown, Pa.
Thos. P. Roth, Orefield, Pa.

LUZERNE COUNTY.

W. H. Lanyan, Hazleton, Pa.

McKEAN COUNTY.

F. S. Palmer, Bradford, Pa.

MONROE COUNTY.

L. D. Ellenberger, E. Stroudsburg, Pa.

MONTGOMERY COUNTY.

John Reig, Jenkintown, Pa.
Wohlert & Waldberg, Bala, Pa.

NORTHAMPTON COUNTY.

T. S. Headman, Seidersville, Pa.

NORTHUMBERLAND COUNTY.

C. H. Weaver, Watsonstown, Pa.
H. F. Frank, Montandon, Pa.

PHILADELPHIA COUNTY

J. R. Giffen, 1826 Willington St., Philadelphia, Pa.

SCHUYLKILL COUNTY.

Walter J. Keller, Pottsville, Pa.

W. O. Snyder, Minersville, Pa.

D. H. Smith, Haas, Pa.

Samuel Buehler, Schuylkill Haven, Pa.

WESTMORELAND COUNTY.

Jos. Thomas, Greensburg, Pa.

YORK COUNTY.

C. H. Snyder, York, Pa.

J. H. Painter, York, Pa.

Inspection of Private Premises:—Since the agricultural people of this State have learned that we have inspectors who can really inspect and give help, and that the work of this office is practical and serviceable, we are having many calls for inspections of private premises.

The only way to do this work is to follow, systematically, township after township, through each county in this State. To provide for this an appropriation of thirty thousand dollars per year was made by the last Legislature. Men were trained for the inspection and demonstration work, and were sent into the field to give the service that was needed and is being demanded. The following is a list of the inspectors and demonstrators that have been on our force during some period of the past year:

Mr. A. T. Baird, J. W. Battleyon, James Bergy, P. R. Boltz, E. C. Bowers, J. S. Briggs, W. H. Brinkerhoff, J. W. Cox, J. R. Davis, H. H. Dutton, Benjamin Evans, Hugh Fergus, James Fergus, A. O. Finn, T. C. Foster, Dr. J. H. Funk, F. Z. Hartzell, C. A. Heiss, J. D. Herr, C. C. Hess, James Hipple, D. C. Kauffman, R. F. Lee, A. B. Lehman, E. L. Loux, D. K. McMillan, C. F. Noll, J. K. Owen, W. B. Packard, W. E. Perham, M. E. Shay, H. F. Shugars, M. H. Snavely, A. W. Stephens, G. P. Stevens, W. G. Winner and W. H. Wolff.

It has not been possible to inspect in all the counties of this State, owing to the fact that enough men to do the work and sufficient funds to put a man into each county are not available, but inspections have been made and demonstrations given in most counties where the scale is found, as follows:

Inspection and Demonstration.

Adams, Allegheny, Armstrong, Beaver, Bedford, Berks, Blair, Bradford, Bucks, Cambria, Carbon, Centre, Chester, Clearfield, Clinton, Columbia, Crawford, Cumberland, Dauphin, Delaware, Erie, Fayette, Forest, Franklin, Fulton, Huntingdon, Indiana, Juniata, Lackawanna, Lancaster, Lebanon, Lehigh, Lycoming, Mercer, Mifflin, Monroe, Montgomery, Montour, Northampton, Northumberland, Perry, Philadelphia, Schuylkill, Snyder, Sullivan, Susquehanna, Union, Washington, Westmoreland, Wyoming and York.

Inspections made but no demonstrations held.

Butler, Clarion, Elk, Greene, Jefferson, Lawrence, Luzerne, Pike, Somerset, Tioga, Venango, Warren and Wayne.

That this work has been highly valuable in helping to save the crops, especially in the orchards of this State, there is no doubt.

This is attested by the hundreds of letters we have received from persons who claim from hundreds to thousands of dollars worth of property saved for the writers by the assistance of this office. It is highly gratifying to know that our work is giving such good results. It should be continued but on a more extensive scale, and to do this properly an adequate appropriation should be made by the next Legislature.

6. INSPECTIONS OF IMPORTED PLANTS, SEEDS AND FRUITS.

Owing to the liability of insects that are very destructive in other States or counties to be brought into this State at any time on imported trees, shrubs, seeds or fruits, it is important that inspections should be made of such importations. We are in readiness to inspect them when it is possible to do so, but there is great difficulty in learning of the importations, as the importers and transportation companies do not send the desired information to this office. It is to be hoped that some plan can be evolved by which it will be necessary for importers and transportation companies to notify our Department of importations of trees, shrubs, plants and seeds from other States, especially from foreign countries, in order that they can be inspected to prevent the introduction of such serious pests as the Black Scale, the West Indian Peach Scale, the Gypsy Moth, the Brown-tail Moth, and other exceedingly destructive pests which are not at present found in this State, but which are liable to be brought within our borders at any time and prove more destructive than any pest we now have if due vigilance be not taken to prevent it.

7. MAKING COLLECTIONS.

We must have collections for comparison and further study of the distribution of insects, life histories, habits, economic effects, enemies, etc., in order to give us keys to practical methods of treating beneficial and injurious insects and other animal organisms. We receive many specimens for name and classification, with requests for detailed information concerning them. They can not be given readily in many cases, because they are broken or in imperfect condition of preservation or immature, but when we have in our own collections properly preserved specimens for comparison with the others sent to us, they generally can be named even from fragments. The name is the key to the literature, and the literature is the basis of the life history studies and may indicate practical experiments and remedies. We can not possibly conduct the work of this office properly without such named collections. Also, in making collections we must study not only the injurious insects themselves, but the predaceous insects, which feed upon them, the internal parasites which attack them, and the enemies of other kinds which devour them or destroy them.

While the time of no one person has been given exclusively or even mostly to make collection, we have collected when possible and have lost no opportunity to preserve such specimens as contributors have sent and which are desired to aid in our studies. The collections made during the past year amounted to three thousand, five hundred and eighty, and the accession numbers in our

catalog reached from 4,849 to 8,428 inclusive. As in most cases there were several specimens in one collection and under one number, this means that our collections for the year stand for hundreds of thousands of individual specimens, and in truth thousands of species. We now for the first time have enough specimens to make exchanges by which we can procure needed material to illustrate economic features of insects and animals which we have not collected, but which will prove of importance to the work of this office, enabling us to become familiar with such creatures before they are imported into this State, to be able to know them by sight while they are yet comparatively rare, and thus have the means of suppressing them before loss is sustained by them.

While our collections have not been made for the purpose of putting them on exhibition, but rather to make a working cabinet, they will be a useful nucleus for ourselves and others for making investigations along zoological and especially entomological lines. However, we have enough good material to form an important and very attractive nucleus of an agricultural or educational museum, and in many features this collection is not duplicated in this or any other State. It would require a great deal of money to procure by purchase, the material which we have, by persistent effort of ourselves and others, been able to accumulate. I deem it important that this office be able to co-operate with the State Museum to some extent, especially the Zoological section of said museum, and be connected with it in such a way as to utilize without further expense to the State, the specimens we have collected, and the expert scientific service which can be rendered by myself and assistants.

Acknowledgment should be made of the intense interest and efficient services of some of my assistants, inspectors and demonstrators, who have taken every possible spare moment of their own time in aiding to make and preserve collections. For example, Saturday afternoons are invariably considered in other offices as belonging to the employes for their recreation or private affairs, when they are free from duty. However, many of my assistants have almost invariably taken Saturday afternoons, summer and winter, for making collections or preparing specimens. In fact, most of our specimens have been collected by such persons and at such time. In due acknowledgment of such faithful application I should make special mention of the work of Mr. A. F. Satterthwait, Mr. D. K. McMillan, Mr. P. H. Hertzog, Mr. W. R. Walton, Mr. W. R. McConnell, Mr. Harold O. Marsh, Mr. F. Z. Hartzell and Mr. Paul R. Myers. I should also take this opportunity to express my high appreciation and thanks to the public, especially to those individuals who have sent us many specimens, and whose contributions have been acknowledged with thanks in the various numbers of our Monthly Bulletins. It is greatly to be desired that such contributions be continued, and acknowledgments will be made in detailed manner in the Monthly Bulletin.

8. DEMONSTRATIONS OF METHODS OF COMBATING PESTS.

The practical citizens of this State have made requests to be "shown". In other words they have not only desired information in the saving of their crops, but have requested that we show them, by demonstrations, the methods of making and applying the materials that will give good results. As a consequence, we commenced the

work of giving demonstrations in making and applying the Lime-sulphur Wash for the San José Scale. These were given at intervals of four or five miles, in infested orchards, and announced both by the local papers and by large posters. The attendance was good ranging from ten to five hundred persons, and an average of about thirty. Hundreds of such demonstrations were given in this State by our inspectors and demonstrators, and reports are now arriving showing that they were of immense value in helping to save trees which were otherwise doomed to speedy destruction. Now that the persons living in the vicinity of such infested but sprayed orchards can see the beneficial results of this work, they are encouraged to go forward by the same methods and save their property.

The immense possibilities of public demonstrations as applied to preserving crops from insect enemies and fungous diseases are such that we feel justified in arranging to take an orchard in each of the fruit producing counties, and make it the scene of demonstration for all the insecticidal and fungicidal operations that are needed through the year to keep the trees and fruit in proper condition. This appeals so strongly to the practical citizen that we have already received many letters asking us to start such demonstration orchards, and we have promised to do so in case proper provisions are made for the expense of the same by the next Legislature.

While this office has pressed forward in active and conscientious work in behalf of this Commonwealth during the past year, there may have been some mistakes made, some things left undone that might have been undertaken, and some things imperfectly accomplished. However, we are satisfied that important service has been rendered that has more than justified the expense of the year. We are at all times open to suggestions and recommendations by interested persons, and are only too glad to have the opportunity to be of further service along the lines already mentioned or on subjects of such other kinds as may be possible in the general field of zoology.

We have had many requests to name weeds or plants, and especially to give the names and remedies for fungous diseases, but we prefer to stay strictly in the realm of Zoology, of which Entomology is an important branch, and refer questions on other subjects to specialists in their respective lines.

With almost no exception, the press of this State has been in close sympathy with our work, publishing reports of our meetings, reports concerning demonstrations and lectures, abstracts from Bulletins and favorable comment upon the labors we have undertaken and are trying to make useful and of practical interest. In conclusion I desire to express my high appreciation of the faithful support of the State Administration and yourself, Mr. Secretary, without which discouragements would have been too great for us to accomplish more than a small fraction of what this office really has done throughout the past year. I hope to find it possible to make the office even more useful during the present year than the past, and to secure the continued co-operation of my faithful assistants, the citizens of the State, the Press, my fellow officers in the Department of Agriculture and the Administration.

Respectfully submitted,

H. A. SURFACE.

Economic Zoologist.



PROCEEDINGS

OF THE

FARMERS' NORMAL INSTITUTE,

AND

State Board of Agriculture,

HELD IN THE

Court House, Clearfield, Pa.,

MAY 29-31, 1906.



PROCEEDINGS OF THE PENNSYLVANIA STATE BOARD OF
AGRICULTURE, AT A MEETING HELD IN THE COURT
HOUSE, CLEARFIELD, PA., TUESDAY, MAY 29, 1906.

ORDER OF BUSINESS.

Call to order at 10.00.

1. Roll-call of Members.
 2. Reading of Minutes.
 3. Appointment of Committee on Credentials.
 4. Reception of Credentials of New Members and Delegates.
 5. Report of Committee on Credentials.
 6. Unfinished Business.
 7. New Business.
 8. Miscellaneous Business.
 9. Adjournment.
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Court House, Clearfield, Pa.,
Tuesday, May 29, 1906, 10 A. M.

First Vice President Fenstermaker in the Chair.

The CHAIR: The first thing in order will be the calling of the roll by the Secretary.

The Secretary called the roll, and the following answered to their names:

Messrs. A. I. Weidner, J. S. Burns, S. S. Blyholder, A. L. McKibben, E. E. Chubbuck, H. J. Krumenacker, John A. Woodward, M. E. Conard, S. X. McClellan, J. W. Nelson, J. A. Herr, A. P. Young, J. F. Seavy, R. M. Heyburn, C. B. Hege, R. M. Kendall, Geo. G. Hutchison, S. M. McHenry, W. L. McCracken, Matthew Rodgers, Horace Seamans, W. H. Brosius, Samuel McCreary, P. S. Fenstermaker, A. J. Kahler, W. C. Black, M. M. Naginey, J. Sexton, I. A. Eschbach, A. T. Holman, H. H. Hall, W. H. Stout, Jacob S. Miller, E. R. Warburton, E. E. Tower, J. Newton Glover, M. N. Clark, D. A. Knuppenburg, G. F. Barnes and N. B. Critchfield, *Secretary*.

The CHAIR: The minutes of the last meeting will be read by the Secretary.

The Secretary read the minutes of the last meeting and they were adopted as read.

The CHAIR: The Chair appoints the following gentlemen as a Committee on Credentials: Hon. J. A. Herr, of Clinton; M. M. Naginey, of Mifflin; J. S. Burns, of Allegheny; R. M. Kendall, of Fulton, and W. C. Black, of Mercer, who will meet at the call of the Chairman. Those having credentials for admission to this body will please come forward and present them to the Chairman of the committee.

While the Committee on Credentials is in session and preparing their report, if anybody desires to make a few remarks, we will be glad to hear from him at this time.

No one volunteering any remarks, the Chair declared a recess until the Committee on Credentials was ready to report.

After Recess.

The CHAIR: The Committee on Credentials has announced, through its Chairman, that it is now ready to report. The report will now be read.

REPORT OF THE COMMITTEE ON CREDENTIALS.

The Chairman of the Committee on Credentials, the Hon. J. A. Herr, read the report of the committee as follows:

Clearfield, May 29, 1906.

The Committee on Credentials make the following report: Lehigh County Agricultural Society sends the credentials of Mr. P. S. Fenstermaker, of Allentown, Pa., to represent them on the State Board of Agriculture.

Also, Centre County Agricultural Association sends the credentials of Mr. John A. Woodward, of Howard, Pa., to represent them on the State Board of Agriculture, in both cases, commencing January, 1906.

We find the above named credentials in regular form and recommend that the gentlemen be seated.

(Signed.)

J. A. HERR,
M. M. NAGINEY,
J. S. BURNS,
R. M. KENDALL,
W. C. BLACK.

MR. HERR: Mr. Chairman, I move that the gentlemen named be seated as members of the Board.

The motion having been duly seconded, and the question put, it was agreed to.

The CHAIR: The next thing in order is Unfinished Business.

MR. McHENRY: Mr. Chairman, I move you that we reconsider the vote by which we passed the report of the Legislative Committee at our last session, and when in order, I will give you my reasons for making this motion.

The CHAIR: You have heard the motion; are there any remarks?

MR. McHENRY: My reason for making this motion—it is only my own idea; perhaps no one else will agree with me, but my idea is that we made a mistake when we approved the proposition that all license fees be retained in the counties in which they are collected. I think under the existing conditions, that it was a mistake. I have not the figures to give you, but I will say, generally, that almost nine-tenths of the license fees are paid from counties in which the large cities are located, and are not our agricultural counties as a rule, and it takes that much money out of the State Treasury to which we must look for appropriations for schools, and for the improvement of our roads, and so on, and is scattered all over the other counties and all over the State. It may be a little selfish, perhaps it is; I don't know, but it may be so regarded, for Philadelphia, Pittsburg and those large cities, to throw their money into the State Treasury, as is usually done.

In my own county, license fees do not amount to very much, for it is almost altogether an agricultural county, and I venture the assertion that what is true there, is true in two-thirds of the counties in the State, if not three-fourths, and these are my reasons for making this motion; I merely want to know what the feeling of the members is.

There being no further discussion, the question was put by the Chair and agreed to.

MR. McHENRY: Mr. Chairman, I now move you to strike out the words "and the license fees." I move to amend that report by striking out those words.

A member called for the reading of that portion of the report as adopted. The Secretary read as follows: "We further recommend the enactment of the law whereby the personal taxes should be retained in the counties in which they are assessed, thereby relieving our overburdened taxation."

MR. HERR: I second the motion on the amendment. As I understand, the motion to reconsider prevailed, and the question before us now is on the adoption of the amendment.

MR. CLARK: Mr. Chairman, in reference to the personal tax, about all our personal tax is retained in the county. I do not think we send any tax out of the county except the State tax. Do not let us go on record and do anything here that is not right. It seems to me that the only tax we send out of the county is the State tax. Now the query with me is, whether the matter of the State tax is included as a personal tax. If you concede that that is a personal tax, of course that would include it; that is what I want to know.

MR. McHENRY: I did not include that in this motion. I thought it would come up in this discussion and I am anxious to have information on that myself—what is meant by that personal tax—whether it is a tax on money and personal property or just what it is that is paid into the State Treasury; if it is included, then I will include it in my motion to amend.

The CHAIR: There is a member of the Legislature in this body; probably he can enlighten us along this line.

MR. BROSIUS: Mr. Chairman, the personal property tax is paid now into the State Treasury, and our contention has been as agriculturists that we should retain that in our counties. I believe that our money at interest is personal property, and it should be, we think, retained at home. That has been my view. We pay no State tax to-day except a personal property tax, and that is properly money.

The SECRETARY: Mr. Chairman, will you allow me to inquire, through the Chairman, whether any part of that tax is returned to the counties now, or whether it is all returned to the counties?

MR. BROSIUS: I think there is a portion of it only returned to the counties. And now our contention, as to this resolution, if I am right—it is intended that it should be all returned. With our immense State revenue, it seems to me that should be done.

The SECRETARY: I understood Mr. Clark to ask the question whether it is not all returned to the counties now.

MR. CLARK: Mr. Chairman, what I spoke of was our personal taxes. Now money—the tax on money is not the only personal tax that we pay. We pay plenty of personal tax that never goes into the State funds at all. My query was this: What part of this tax do we want to include in this? It seems to me that we should amend it so as to include that part of the personal tax that is now paid into the State Treasury.

MR. HERR: Mr. Chairman, make that “personal property tax” and that will cover it, will it not?

The SECRETARY: If that were made “personal property tax” and the other should follow immediately after the words “personal property tax,” the words “that are now paid into the State Treasury,” that would make that very plain because that would be the tax assessed upon money at interest and nothing else. Now while you are amending this report, while the amendments are being considered, you can insert that, and that will make it all right and make it plain.

MR. KAHLER: Mr. Chairman, in regard to the question of the money returned to the counties, the object of this recommendation was that we retain it all in the counties. Now it seems to some of us that it is hardly worth while to pay money in and get money back. Why not leave it in? A great many of us think we are overburdened with taxation; that would help to balance it. We

have been trying to get some redress for local purposes and for some reason we have not been able to secure it. Now while we cannot get a whole loaf, our object was to get a little, and I for my part, am emphatically opposed to striking that out. I believe that there is a large sentiment in this State in favor of a proposition of that kind, that it all be retained in the county.

MR. BROSIOUS: Mr. Chairman, I suppose that the gentleman must have misunderstood me. What I meant to be understood was, that I believed the State could well afford to do without it, with its immense revenue, and that it should be retained in the county, and the change, as I understand it, that this gentleman wishes, is that the license fees, etc., should be retained in the county.

My contention as a farmer is, has been, and is to-day, that we as farmers want to have all the benefit of all the money that is out at interest in our districts, and therefore that should not be changed. But it is a question with them there now. Of the license money collected, it is divided, and a certain amount goes to the county, a certain amount to the State and a certain other amount to the townships, but I really cannot specify the amount. Possibly the gentleman is right in regard to the distribution. Philadelphia and Pittsburg are large cities and have a great deal of license money, but I would not like to go on record as to that, but I think that the State with its vast income can afford; not only to let us have that, but to let us have a lot more.

MR. BOND: Mr. Chairman, I think that the proposition to retain the license tax in the county is very meritorious. I live in a county where the liquor license costs hundreds of thousands of dollars, and I believe that we should receive every dollar of that license back to help us to pay the expense of criminal cases that cost us hundreds of thousands of dollars that have to be paid out of our county treasury.

MR. McHENRY: Mr. Chairman, my sole object in having this sent to the State Treasury, is simply to equalize that money that comes from a traffic that does no one any good, and the only way you can equalize that over the State, is to let it go into the State Treasury, that comes from these counties that have been spoken of. I know that we do not get from Brother Bond's county, but we get this element that a bad influence has been exerted upon, from those counties, and we get that out in our agricultural counties, where we do not have much of that kind of a thing, and the only way we can get our share of it is to have it go into the State Treasury first and then have it paid back for road and school purposes. I am not certain that I am right; I think there is a certain portion paid to boroughs, whereas the townships in which a licensed hotel is located, receives very little benefit, I think that is the idea, as I understand it.

The SECRETARY: Mr. Chairman, that is correct.

MR. McHENRY: Now take it in my own county. We do not have but one licensed hotel that gives anything to the township, they are only in the boroughs and only in the cities, as a rule in

other counties, and I believe we make a mistake when we recommend our taking this fund and returning it again. As I said before, it may be slightly selfish, but I feel that it is doing no harm to get from the State all that we can get from the agricultural people. As I said, it may be slightly selfish to want to draw this large amount that comes from Philadelphia and Pittsburg and all those large cities that goes into the State Treasury. Now if we recommend this, and the Legislature passes it, it is done at the recommendation of the agriculturists themselves, and takes money away from them, as I know we do not have a very large amount compared with what we need. I thought it would be wise to take this up in order that it might be fully discussed.

MR. KAHLER: Mr. Chairman, I wish to say this, that while the gentleman objects to the money being retained in the boroughs and cities, he must recollect that we are not the only people that sacrifice. A great many people pay some of the taxes in these towns. As a rule, our towns are paying a heavier local tax than we are. Now why not retain that? The State is not in absolute need of it by any means; the revenues of the State are immense, and in a great many boroughs it is a material help to their local taxation to have this amount of money retained in their counties, and I think we should have it, for the traffic which costs thousands of dollars every year to defend criminal cases—that grows out of this traffic, and from which we get very little benefit.

MR. MILLER: Mr. Chairman, that don't really benefit the agricultural part of the county at all. We have in Somerset county probably three townships that have licensed houses and that pay a very small amount into the county treasury or into the State Treasury and I think fifty per cent. is returned. That amounts to very little in a township, and it is the boroughs where the licenses are paid and returned to them, that get the benefit, while the rural districts which help to keep up the saloons—they send their boys in to drink—and there is no return except misery.

MR. HERR: Mr. Chairman, I think it is a misapprehension to talk about selfishness. I do not think that the benefits should be confined to the cities and boroughs instead of our rural districts, if benefits flow from these license taxes. I know that in our county we do not get a bit of it; the share of it that goes into the State Treasury should benefit us and I think we can with propriety ask for an increased appropriation for our school and road funds. It does not help us to pay costs of these criminal cases either. It is retained there as a borough fund, really, and not as a county fund. It is returned there, as I understand it, into districts in which the licensed houses are located; if that is so, it don't benefit our rural districts. Now it is an immense fund and I do not think you need to consider the interests of the boroughs and cities. I think they are quite able to take care of themselves.

MR. BOND: Mr. Chairman, isn't it the object of this motion to remedy that defect? Is it not the intention of that amendment to have the money refunded to the county treasurer? The resolution that has been passed in all meetings that I ever had any interest in

and the efforts that have been made in the Legislature, to have that law passed, with the intention of having it returned to the county treasury, and not having it returned pro rata to the townships and boroughs as the division is made now, is what I understand to be sought.

MR. MILLER: The resolution says that the whole of it is to be returned.

MR. BOND: To the county?

MR. MILLER: It would have to be returned to the place where it originated.

MR. HERR: My understanding is that it is to be retained rather than returned.

A Member: Mr. Chairman, would it not be well now to appoint a committee to get this in proper shape before decisive action is taken, rather than to go ahead and say something that will not sound well after you have said it.

The CHAIR: Are you ready for the question on the amendment to the report?

MR. CLARK: Mr. Chairman, will you kindly have the amendment read so that it will be understood?

The CHAIR: Will the Secretary please read the part desired?

The SECRETARY: Mr. Chairman, the report of the committee as it now stands under consideration reads as follows: "We further recommend the enactment of a law whereby the personal taxes and the license fees should be retained in the counties in which they are assessed, and thereby relieve our overburdened taxation."

The motion to amend was to strike out the four words "and the license fees" so that if the amendment passes it will read as follows: "We further recommend the enactment of a law whereby the personal taxes should be retained in the counties in which they are assessed and thereby relieve our overburdened taxation."

MR. SEXTON: Mr. Chairman, as I understand it, that resolution has already passed and we are discussing it after it has passed.

The SECRETARY: Mr. Chairman, for the benefit of Brother Sexton, through the Chair, let me say that the motion was to reconsider the vote by which the report was adopted and that motion prevailed, so that now this report is before us just as it was originally, and then the brother from Indiana county offered the amendment.

MR. BROSIUS: Mr. Chairman, if we adopt this amendment, it would stand in regard to licenses the same as it is to-day. Then we say nothing about the licenses and unless we would have legislation it would remain exactly as it is; that is my understanding of it.

The SECRETARY: Mr. Chairman, that is correct; the amendment will leave it just as it is now; the amendment as offered refers only to the liquor licenses.

The CHAIR: Is there any further discussion?

There appearing to be none, the Chair put the question, and a *viva voce* vote was taken which left the Chair in doubt as to the result, whereupon a rising vote was taken, the question being on the amendment to strike out the designated words, and the motion was lost.

The CHAIR: Now the question is on the adoption of the report of the committee. Those who are in favor of same will say aye, opposed no; it is carried.

The CHAIR: Is there any more unfinished business? If not, we will go on to New Business.

The SECRETARY: Mr. Chairman, under the head of New Business there is a matter that I would like to submit to the Board, and that is this: The act of Assembly provides that the election of officers shall take place on the fourth Wednesday of January at their meeting at Harrisburg each year. It has been customary to meet on Tuesday preceding the first Wednesday in January—am I right about that?

MR. HERR: Wednesday.

The SECRETARY: It has been customary, with but one exception, to meet on the fourth Wednesday of January. There are some people who want to hold their meetings at the same time; for instance, the State Live Stock Breeders' Association, in whose work we are all interested, and the State Dairy Union would like to hold their meeting the same week in order that they may have the advantages of the lecturers employed by the State Board, and that we may have the advantage of their lecturers employed by them, but if we meet on Wednesday, there would be only left four days of the week. They came to me and asked if we could arrange to begin our meeting on Tuesday, so that they might have a part of the time during the week, and I said to them in reply that it was not a matter for me to decide. I shall be pleased to have the matter taken up by the State Board or by the Executive Committee and I shall be glad to follow their instructions. I shall be pleased if the State Board or the Executive Committee will take some action in regard to this matter. I have had requests from the Dairy Union and also from the State Live Stock Breeders' Association asking that we begin our meeting on Tuesday. If we do we will have to put off the election of officers until the second day of our meeting. Those of you who were present then, know how we got along. This is a matter for you to consider now.

The CHAIR: You have heard the suggestion of the Secretary. Is there any motion?

MR. CLARK: Mr. Chairman, this matter has been mentioned to me quite frequently. Men who are very much interested in this question have spoken to me about it, and I can assure you that I

heartily wish that this convention may place it within the power of the Executive Committee or of the Secretary himself to call a meeting of the State Board of Agriculture on Tuesday, so as to give room for the other meetings to follow, and I do not know but it would be proper to make a motion to that effect to call a meeting on Tuesday.

MR. SEXTON: Mr. Chairman, does not the law fix the time when the meeting of the State Board of Agriculture is to take place?

The SECRETARY: My impression of the matter is that the law says that the election of officers shall take place on the fourth Wednesday of January, at the annual meeting of the Board in the city of Harrisburg. I do not think that there is anything in the act of Assembly that prohibits our going into session on Tuesday only so that we are in session on Wednesday when the election must take place.

A Member: Mr. Chairman, has the State Board any by-laws?

The SECRETARY: I believe that the State Board does not have any written by-laws. Secretary Edge, I think, at the last annual meeting made the statement that there are no written by-laws.

MR. HERR: Mr. Chairman, I think we have certain by-laws to regulate our admission and so on; but I think the Secretary is mistaken in his stating that the law creating the Board of Agriculture simply says that we must hold our election on Wednesday; I think it says that the Board shall convene on the fourth Wednesday in January at which time the annual election shall be held. We could hold the election on Thursday if we wanted to, but that is the date fixed for our meeting. I do not know that there is anything in the law to prohibit us from having a special day; but I know this, that inasmuch as the State Board of Agriculture is the recognized body of the State to hold these meetings, and the other Associations are not State associations, we should not divide up all our time and give too much of it to other organizations. We have now at our disposition a fund to pay for our annual meeting and to secure lecturers, and we are willing that that fund shall go to a certain extent where our friends want it to go in the line of stock breeding, dairying, and so on, that are so closely connected with the line of agriculture, and that is as appropriate to our work as it is to theirs, but I am opposed to cutting up any part of the time that should properly belong to our meeting. I won't oppose the motion to meet on Tuesday, but I shall oppose the motion to adjourn before the evening session on Wednesday. Sometimes some of us have to miss some of those sessions; it has been customary for the trustees of the college to meet on Tuesday evening preceding the meeting of the Board of Agriculture because a good many of the trustees are members of the Board of Agriculture and are interested in the meetings of the Board of Agriculture. The suggestion was that we adjourn Wednesday afternoon and give them Wednesday evening and Thursday. I do not see why their meeting cannot convene on Thursday morning instead of taking part of the one day that the law requires the Board of Agriculture to meet.

MR. BLACK: Mr. Chairman, I think that the Pennsylvania Live Stock Breeders' Association would be entirely satisfied to come in on Thursday. I do not think it is their wish to limit the meetings of the State Board of Agriculture at all.

The SECRETARY: Mr. Chairman, I would state that they made that request as stated by Brother Herr. It is very interesting to the live stock breeders to attend the meetings of the State Board of Agriculture, and possibly it might be of interest to some members of the State Board to attend the meetings of the Live Stock Breeders' Association. The Secretary will be satisfied with either arrangement; I can't see that there is any material difference whether we listen to an address or to several addresses delivered under the auspices of the Live Stock Breeders' Association or whether under the auspices of the State Board of Agriculture. We are all interested in the same line, and that is why we are good friends. The Breeders' Association look at it in this way. They will have their lecturers there, and we will have ours, and both organizations can have the same men in some instances, but it is a matter of entire indifference to me as to whether we shall allow them to begin their meetings on Wednesday or not. If we begin on Tuesday, we shall have all day Tuesday and Tuesday night and also two sessions on Wednesday; we will be able to have four or five sessions; then they would like to come in on Wednesday evening and continue through Thursday and that would give the Dairy Union people an opportunity to get in with their work, so that those who are there as members of the State Board would have an opportunity to attend their lectures right along the same line. I do not know that we have had a better presentation of live stock breeding than we had at our last meeting.

I feel just a little bit like Brother Herr—the State Board is a State institution and we can do as we please about this matter. Perhaps we will be conceding a little too much to give them the Wednesday evening meeting, but we must remember that the different sessions are made up, as it were, for the benefit of the same family, or for the same object.

MR. HERR: Mr. Chairman, the holding of a meeting on Wednesday evening would be a benefit to the Breeders' Association because they have no funds except their annual dues, while we have a fund which is to be devoted to our work; we cannot appropriate that to the Breeders' Association or any other, although while it would really lessen their burden to have a meeting on Wednesday evening, I do not know that it would increase our own. It is a little difficult to get there for a Tuesday morning's session. Such an arrangement would leave two days, Friday and Saturday, to go home on, and only one day to come on, and it seems to me they can just as easily extend the time.

MR. ORR: Mr. Chairman, I am not a member of this Board, and it has never been my privilege to attend a winter meeting of the State Board of Agriculture, but I would like to say here to the State Board of Agriculture that I think that instead of feeling that these other organizations in the State of Pennsylvania are infringing in any way upon their rights, privileges or prerogatives, it seems to

me that this State Board of Agriculture should be disposed to co-operate with the Breeders' Association, the Dairy Union or other organizations of that kind who want to meet with them in the same week and take part in their work, and share a part of the privileges that they may have at that time. It seems to me very desirable that all these organizations should meet in the same week. I know that in the State of Ohio the Sheep Breeders' Association and different other organizations—Shorthorn cattle, Jersey cattle, swine breeders and other associations meet the same week. In Indiana the same thing has existed for several years. I have been in Indiana at the time of the holding of their winter meetings, and instead of there being one thousand, 1,260 were present, and took part, not only in the Corn Growers' and Stock Breeders' Association, but other organizations that met at the same time, and I do hope that this may continue, and that a committee may be appointed which shall be empowered to arrange with these other associations to cover the whole time, having a popular meeting at night, say the first popular meeting on Tuesday evening under the auspices of the Breeders' Association, if you please, and another one on Wednesday evening under the State Board, and another one on Thursday evening under the auspices of the State Dairy Union.

I think that the State Board of Agriculture ought to feel itself complimented and that they should do everything in their power to bring these organizations together at that time so as to have one good, big full week devoted to the interests of agriculture and to the stock breeders and dairymen of the State of Pennsylvania.

MR. CLARK: Mr. Chairman, I made a motion which has not been acted upon.

The reading of the motion was called for.

The SECRETARY: Mr. Chairman, as I have noted it, the motion was as follows: It was moved by Mr. Clark that the Secretary would be authorized to arrange the meeting of the State Board of Agriculture so as to begin on Tuesday.

MR. STOUT: Mr. Chairman, couldn't you arrange to have this order of business without doing that? Don't that disarrange the whole proceedings of the Board according to the requirements of the law?

The SECRETARY: Mr. Chairman, the election of officers must be the particular order of the day on Wednesday under the act of Assembly.

MR. SEXTON: Mr. Chairman, I agree with Mr. Orr who suggested that the Board of Agriculture ought to feel complimented by the request of the other organizations to participate with us at the annual meeting. We certainly do, but we want them to do much better in that line in the future than they have done in the past, when perhaps they came in the afternoon or in the evening to meet us. I think it would be well to hold on to our old custom of having the full State Board meeting on Wednesday and Tuesday as well if we decide to open the meeting Tuesday morning; that is all right, but we want both Tuesday and Wednesday and it seems to me that

the Secretary can arrange for speakers on Wednesday evening. If we want the Association to help us we can have some of the prominent breeders give us an address on that night. It seems to me that that would be all right.

Mr. Herr asked for the reading of the motion made by Mr. Clark again.

The Secretary read as follows: "Moved and seconded that the Secretary be authorized to arrange the meeting of the State Board of Agriculture so as to begin on Tuesday."

MR. HERR: Mr. Chairman, I move to amend Mr. Clark's motion by saying, "to adjourn not earlier than Wednesday night."

The SECRETARY: Mr. Chairman, the Secretary would never take the authority to make any other arrangement.

MR. HERR: Mr. Chairman, the Breeders' Association have asked for Wednesday evening and I think that the Board ought to have it.

MR. CLARK: Mr. Chairman, that is all right, the Secretary will do what is right; we are satisfied he will.

The question being on the amendment, it was agreed to.

The question recurring on the original motion as amended, it was agreed to.

The CHAIR: Is there any more New Business?

MR. KAHLER: Mr. Chairman, I ask leave to offer a resolution.

There being no objection, the resolution was read by Mr. Kahler as follows:

Whereas, Agriculture is regarded as a paramount interest of our State, and contributes more to the general welfare of the State than any other industry, and

Whereas, This Board for years in the past have labored for the uplifting of agriculture and education, and as we are aware that it is absolutely necessary that we have legislative aid to accomplish work, and there is no means of accomplishing it except through the agency of the ballot box, and

Whereas, This Board is absolutely a non-partisan association,

Therefore be it Resolved, That this Board of Agriculture of Pennsylvania pledge its individual support, and as there has been in the past and is in the present an atmosphere of reform, that we pledge our best efforts and will use all honorable means along non-partisan lines to see that the very best men are nominated and elected in the coming campaign, men that are identified with our interests and who will give us a fair deal.

Mr. KAHLER: Mr. Chairman, I would say in support of the resolution, that I think it is an opportune time before our officers are selected, that we look, as all other industries do, a little to our own interests on non-partisan lines, and I think that we should devote a little more attention to our own interests. I, therefore, move the adoption of the preamble and resolutions.

MR. HALL: Mr. Chairman, I second the motion.

The question being on the motion it was agreed to.

MR. HALL: Mr. Chairman, there is a matter in the way of an unofficial statement in regard to the fact that there is to be new appointments at State College that will amount nearly to re-organization. It is almost absolutely certain that the Board of Trustees will be obliged to agree upon some one to take Dr. Atherton's place. It is also stated that Dr. Armsby is to be given the charge of the Bureau of Animal Nutrition and there will be a new man appointed as Dean of the School of Agriculture and in charge of the Experiment Station.

Now all the members of the Board know that the Act that created and provided for the land grants for colleges, of which Pennsylvania State College is one, specified that it did so, that they might give instruction in agriculture and the mechanic arts. Those of us who have visited the State College and given any thought to the matter, must have been struck with the disproportion of development between the primary and the secondary mission of the college. The secondary mission—the instruction in the mechanic arts—has been brought to a very satisfactory state, but the primary mission—the instruction in agriculture—seems not to have reached so satisfactory a state. Now it appears to me that one of the things that this Board ought to do, is to express its opinion as to who should succeed Dr. Armsby and Dr. Atherton in these positions. Now it would seem to me that it would be a good thing for the Board to urge upon the Board of Trustees that those positions be filled by men who are graduates of some agricultural industrial college, and when I say that, mean graduates of some college that has developed along the lines that the Act evidently intended they should develop.

Now all of us would deplore very much any reorganization of that college that would lower the standard of the department of Mechanic Arts, but all of us would hail with joy any reorganization there which would bring agriculture up on a level or even put it in advance of the department of Mechanic Arts, and it seems to me that we ought to recommend men for these two positions whose education and training and subsequent achievements are such as to ensure their being in sympathy with agriculture, so that those of us who visit the college may not find, as we do now, that the college spirit is not in favor of agriculture. If we had men in the two positions named it seems to me that that proportion and that spirit might be changed so that the college would be known just as widely and just as favorably for the strength of its department of agriculture, as it is now for its department of Mechanic Arts.

I do not know that it would be right to commit the Board to it but it seems to me that a resolution asking the trustees to fill those two positions with graduates from some agricultural, industrial college would now be timely.

The CHAIR: Are there any more remarks upon the resolution?

MR. BEARDSLEE: Mr. Chairman, I do not think there is any risk to run at all in this matter, and that the proper thing to do is

just to leave it in the hands of the Board of Trustees. I think they are qualified to do the right thing.

MR. BROSIUS: Mr. Chairman, it seems to me that we would be very unfit to recommend anyone for those positions. To-day the college does stand as one of the leading colleges of the State, while many men who work along agricultural lines think it has been diverted from its original intent, to make an agricultural college. Any one that has read the law—the Morrill law—will find that it was intended to help develop Pennsylvania in all her great industries; and while it is perhaps true that it can do better than it has done in the past, yet many of us who live a hundred miles or more from the college are hardly fitted to judge of its needs, therefore, I agree with our friend here that the wise way is to allow the Trustees to take care of the college.

MR. HERR: Mr. Chairman, the subject is one of very great interest to me, and ought to be to every member of the State Board of Agriculture, and I feel that I am justified in saying, on behalf of the Board of Trustees, that I believe it is their purpose to strengthen the agricultural department of that college all they know how. I believe they are working with a common purpose to that end.

The Pennsylvania State College is our college and we are interested in it. It is a great institution and it has a very high standing with a strong corps of professors in the faculty, which it must necessarily have, and it must maintain an efficient corps of instructors throughout.

I want to tell you most emphatically that you can't appreciate and do not know the amount of expense incurred to keep up its present efficiency.

We are burdened with debt and I want to say this to you, that the appropriations that come from the Legislature, the great bulk of them, are specific. They can only go for the special purpose for which they are appropriated. We can't apply them to making the college more efficient, and building it up, increasing the strength of the faculty, and increasing the facilities for education there. With the increased number of students who come there every year, they need much greater facilities. While they have some eight hundred students, they are only properly equipped for about two hundred or two hundred and fifty, and without additional appropriations for general purposes instead of specific ones, as has usually been the case, it is impossible with the debt now existing to make the college what it should be, and it is up to you farmers to see to it that the men whom you elect to the Legislature be made to understand the situation and give us more money for general purposes.

All over the State I hear it said: "Why, Carnegie gave you \$150,000; Schwab gave you another \$150,000 and yet you say you want more money." They forget that this all entails additional expense to the college to take care of these new buildings that have been erected and to properly equip them. I want you to instruct your members of the Legislature that we must have more money for maintenance and for equipment; that is where we are lame. We are doing the very best we can, and accounting for every dollar of the money that is spent there, but we must have larger appropriations for the purposes I have stated. The Agricultural Depart-

ment of the Pennsylvania State College, if the farmers had taken hold of it long before as they have in the last couple of years, would have been way ahead of where it is now, but when we had an agricultural building worth two thousand dollars with an engineering building worth \$250,000, it is easy to see where the students would drift to.

When we get the right faculty and equipment in the Agricultural Department, we will have more students in the agricultural course. That is the common purpose we want to work for, and we ought not to support members of the Assembly who will not stand by your agricultural interests in the instruction of our youth.

I am in earnest in this matter, and I have been on the Board of Trustees for a long time, and I have studied over it and grieved over it. It has worried me a great deal to find just how that college stood, but we have done the best we could with the amount of money that we had to support it. We need additional support and if you would go there and examine it, you would find out that we need some help, if we are to make the college what we want it to be.

That new building—McAllister Hall—we were simply obliged to go into the market and borrow the money to build that hall because we couldn't accommodate the students without it. I believe it is self-sustaining. It is an important thing, but the debt is there, which ought not to be there, and they are really obliged to make the debts. I want the Legislature—I want the sentiment of the people to go in there and say to the Legislature and to the Governor that they must help us out of this predicament and give us the appropriations that we need in order that we may have a college that we want.

MR. BEARDSLEE: Mr. Chairman, I am in favor of electing a Governor who won't veto what the Legislature does.

MR. HERR: Mr. Chairman, that is right.

The SECRETARY: Mr. Chairman, don't you want to be sure first what the Legislature will do?

MR. BEARDSLEE: Mr. Chairman, well, what they did do; they cut the appropriation right in two.

MR. BLACK: Speaking of the fact that the appropriations are specific, I recall that we wanted a few steers at one time out there and they had no money to devote to that purpose and they indicated that if certain persons would donate some steers, they would take care of them. Several members in Western Pennsylvania donated some steers to the college. Some two or three months afterwards, they sent for a sample of corn. These steers were donated and the freight was paid by the State and they were delivered at the college.

The CHAIR: Mr. Hall, did you want to offer a resolution?

MR. HALL: Mr. Chairman, if I offered a resolution now, it would be to the effect that the Legislature appropriate an adequate amount, with no strings to it, to give the college what it wants, and to pay its debts.

MR. BEARDSLEE: And let them buy their own steers.

MR. HALL: Yes.

The SECRETARY: Mr. Chairman, I move that we do now adjourn.

The motion being seconded, it was agreed to.

N. B. CRITCHFIELD,
Secretary.

PROCEEDINGS OF THE FARMERS' ANNUAL NORMAL INSTITUTE, HELD IN THE COURT HOUSE AT CLEARFIELD, PA., MAY 29, 30 AND 31, 1906.

Court House, Clearfield, Pa.,
Tuesday, 2.00 P. M., May 29, 1906.

The meeting was called to order at the designated hour by Deputy Secretary Martin, who announced J. W. Nelson, of Shawville, Pa., as Chairman, and also made the following remarks:

DEPUTY SECRETARY MARTIN: Before entering upon the work proper, it would be well to state that we have question blanks here for distribution, and we request that all members and visitors make use of these blanks, write the questions which you desire to ask and at the close of every lesson, the questions can be taken up and answered. We have with us, as you will have observed, a stenographer, it being our intention to take down the entire proceedings of the meeting. Please be as concise and direct as possible in order that the stenographer may prepare a manuscript that will be entirely satisfactory.

We would appoint as a committee to distribute and take up the question blanks, Mr. George F. Barnes, of York, and Mr. Chubbuck, of Bradford counties, who will have charge of that part of the work.

I know of nothing additional to say, my friends, further than express the pleasure it affords me to look into the faces of such a goodly number of the old workers—farmers institute workers of the State. We should say, however, that even here in Clearfield county, a county which takes a great interest in this work, we invite the citizens of the town and the county to join with us. They are heartily welcome to this meeting, and we shall be glad to have them engage with us in the discussion of the topics that are on the program.

We would also be pleased if the delegates not only would enroll their names on the registry list, but all others present. This can be done at any time when it will not disturb the meeting.

Now without further remarks, the meeting is placed in the hands of your chairman, Mr. Nelson.

MR. NELSON, Chairman: Mr. Secretary and Members of the State Board of Agriculture, and Institute Lecturers for Pennsylvania: It surely gives me a great deal of pleasure to welcome you people here to our town of Clearfield.

For the five years or more that I have had charge of the Institute work of Clearfield county, my associations with the members of the State Board of Agriculture, have been of the most pleasant and agreeable kind, and I assure you that I have enjoyed your meetings and have received a great deal of information during those years, and when I decided last winter to retire for a while in favor of a friend of mine who, during the next three years will take my place in the State Board, and I am glad that I have been successful in achieving this result, and I am glad that I have the pleasure of

speaking to you in my own native town to-day; glad that my last official connection with the State Board of Agriculture is in the town of Clearfield. I hope you will enjoy your stay here, and that you will find it both pleasant and profitable.

The county of Clearfield has taken a front rank in the institute work, and during the last year we held twenty-four days of continuous institute work in the county. I don't know what we will be able to do in the future, for the good Book says, "Let not him that putteth on his harness, boast like him that taketh it off." I want to apologize for the slinness of the attendance at this afternoon's session, which is due to the fact that there is a convention in session at the other side of the river, and the room is full over there, and that has necessarily kept a great many of our farmers away this afternoon.

I now have great pleasure in introducing to you the orator of the day, Judge Allison O. Smith, who will deliver the address of welcome to the visiting members of the Department of Agriculture and members of this organization.

ADDRESS OF WELCOME.

By JUDGE ALLISON O. SMITH, *Clearfield, Pa.*

Mr. Chairman: To me your officers have assigned the pleasure of welcoming your body to our midst, and I sincerely hope you will not measure the scope of your welcome by the shortcomings of the address.

Clearfield county, as you all doubtless know, is not primarily an agricultural county, lumbering having been the chief business of past years. Mining and manufacturing, particularly of clay products, and railroading, furnish employment to the great majority of our people to-day. Scientific and intelligent agriculture is, therefore, in a measure in its infancy. Certainly then the educational influence of this institute with its varied program of instruction by learned professors, deserves from everybody in Clearfield, a hearty welcome.

It don't hurt to tell the truth, even about ourselves upon proper occasions, so that I want to say now to you who are strangers in the county, that the truth is that farming is not at the very highest stage of development in this county. This condition, I may say further, is not a criticism upon nor the fault of the very active and intelligent body of farmers of the county whom you will meet and whom it is my pleasure to greet at this institute. They are all right and are securing good results, but my complaint is that there are not enough of them. Our shortcomings, as an agricultural county, came about from natural conditions not hard to fathom.

Not to mention some possible disadvantages of soil and climate, the farmer of this county in the past only made farming an incident and not the real business of his life. So long as there remained a raft of timber on his farm, or in his neighborhood to cut and de-

liver, he preferred to make his money out of it and farmed simply as a secondary matter, only enough to feed himself and his stock, generally even falling short on that. The best powers either of mind or body were not given to the farm. With the passing away of the timber, his occupation was gone, and it too often became a serious problem for the old farmer to know how to make it go. We may truthfully say, therefore, that the Clearfield county farmer of past generations lived and died in the firm belief that farming here was a failure, and did not pay, and he was right from his point of view. So too, the boys, as a rule, left the old farm in the same belief, and became the professional man, the merchant, the mechanic and the miner of this generation, perhaps not to their advantage, either. The result is too apparent to anyone traveling through the country and shows itself up in hundreds of abandoned farms and vacant farm buildings with cleared fields surrounding them now grown up with briars and weeds.

Now it is perfectly apparent to any one who gives this subject thought, that the future welfare of the county, demands that more and more intelligent farming shall be done, or a source of great wealth be lost. Large areas of cleared land now idle with the soil being washed off annually by rains, should be redeemed, cultivated and made to produce something, if not an annual crop, then let it by all means be re-forested intelligently. It is of course too true, that in many parts of the county, at least, we have positive disadvantages of both soil and climate, and there was probably more truth than poetry in the complaint of the old lumberman farmer that it did not pay to farm as he did it. I take it too, that there may still be serious drawbacks in making it pay if followed on the old lines, and where mere grain growing is attempted; but what is the matter with dairying, raising poultry, truck farming and fruit raising? Are they not profitable? The handicap of soil and climate is amply recompensed by the higher price obtained for such products; quality too, is all right. For instance we get strawberries in our market from Florida in the early spring, and so on up along the coast, until the home berry is marketed in the summer. Now the plain fact is, that the best flavored and best strawberries generally speaking, are our own berries, grown in the Grampian Hills. So too, the best peaches marketed in Clearfield, are home grown, and I hope soon to see the day when we will not need to go to New York state for our best apples.

Now all this leads to one thought and one conclusion, and that is, that there is successful and profitable farming to be done in this county in spite of tradition to the contrary. Our only trouble is, as I view it, that not enough of our people have been giving the subject intelligent and thoughtful attention. With our vast population engaged in other trades, we of course cannot hope to be self-supporting and self-sustaining in all food products for man and beast, but a proper study into the nature of our soil and the uncertainties of our climate should demonstrate what to attempt to raise and what to leave alone, and will surely bring success along some lines.

May we not hope that the next generation will see our hills and valleys covered with fruit orchards and truck farms, financially successful beyond our dreams. If that day ever comes, however,

it will be due to the diffusion of scientific knowledge on farm topics which is taught through farm institute work such as we are now doing. The farmer of to-day must be intelligent, a thinker, as well as a worker. Time and money spent in institute work is well spent, and your work of education among us should be productive of the greatest benefit to all. We are indeed highly honored by having the leading thinkers of the State on farm and kindred topics among us on this occasion, and we fully believe that the helpful and stimulating influence of this meeting will be felt for years to come.

In the name and on behalf of all our people, I bid you a hearty welcome, and bespeak for your session both pleasure and profit.

The CHAIR: I now call on the Secretary of Agriculture, the Hon. N. B. Critchfield, to reply to the address of welcome.

RESPONSE TO ADDRESS OF WELCOME.

By HON. N. B. CRITCHFIELD, *Secretary of Agriculture.*

Mr. Chairman, Judge Smith, and Citizens of Clearfield County: Everybody likes to feel that he is welcome wherever he goes, and it is certainly very agreeable to us to have the assurance that we have just received that we are welcome to this beautiful little city. My greatest regret is, sir, that the Governor of our Commonwealth, who is President of the State Board of Agriculture, is not here to reply to the very eloquent address to which we have just had the pleasure of listening. We have heard of the resources of your county, and we rejoice with you in their possession, for what belongs to Clearfield county, belongs to Pennsylvania; and so we rejoice with you in the possession of your forests and your mines and your agriculture, which we are sorry to hear you say is not in a flourishing condition. We not only rejoice in our possession with you of the wealth of which you can boast, but we feel proud to be recognized as fellow-citizens of the good people of Clearfield county. We farmers have come to understand that if we are going to do our best with our herds and our flocks, it is important that we shall not breed too closely along the same family line; we want to bring new blood into our herds if we are to do our best, and I take it that what is true with regard to the lower animals, is true also in relation to the human race. I believe that the best people are those who are descended from many races, and if I am not mistaken with regard to your history, there courses through the veins of the people of Clearfield county the blood of the very best nations of the old world. When we go into some communities, we find the people descended from a single race; for example, in some communities we find that the ancestry is entirely German; in others, Scotch, in others English, in others Welsh, and in others Irish. but if I am correctly informed by a gentleman with whom I have had some conversation this morning, your early settlers in this county, came from Germany and from Scotland and from Ireland, and England,

and you even have here the English modifications that are found in the old Quaker stock of Eastern Pennsylvania, which we all know is not bad stock, therefore you ought to be good people, bred as you are, and it is not to be wondered at that you have the hearty, energetic, intelligent citizenship that we know resides in Clearfield county. We are glad as we come here, to recognize this, and we feel proud to be your guests, and glad to be here, to receive this royal welcome.

But now, Mr. Chairman, if you will excuse me, I must tell you something about ourselves. I remember years ago to have read a very amusing little anecdote of a pious Irish girl, who, on a certain occasion, went to confession, and while she was telling the priest of her short-comings and her failures in life, she looked up into his his face and said: "Father, I must tell you that I am engaged to be married to Patrick Dolan, and Pat was to see me the other night, and stayed until after twelve o'clock, and he kissed me." The priest being in a rather jovial humor said, "Now Mary, didn't Pat kiss you more than once?" And quick as a flash came the reply. "Now Holy Father, I came here to confess, and not to boast." And so like the Irish girl, I did not come here to boast, but I want to say to you, sir, that the brawny hands that we reach out to-day to receive the royal welcome extended to us, are the hands that feed the world.

Standing here in the temple of justice, I can but admire your work as it relates to all the liberal professions of life. I was walking over your town this morning and I admired the beautiful workmanship of your artists and artisans, and I heard some gentleman tell of the great fortunes have been amassed by some of the people here who have cut down your forests and taken your lumber to market, and we admire the business skill and acumen that have enabled men in the past in your midst to accumulate these great fortunes. But sir, what would become of the race, if for but a single year, the farmers of the country were to neglect to improve the seedtime and harvest which a kind Heavenly Father has promised to give through them to the children of men. Our calling is not only the oldest under the sun, but it is the one calling without which the world cannot survive.

You have referred to the fact that the farmer needs to be educated, and we have in recent years come to understand this matter as we never did before. We have come sir, to look upon our business as a profession, and we have come to realize that there is no industry that stands so closely associated with the great forces of nature as does the industry of agriculture. We realize the need of education, and so a beneficent government has in response to our call established our agricultural colleges all over our land. We have them in almost every state in the Union, but sir, we cannot all attend college. Some of us are too old, and those of us who are young, are under the necessity of battling with the realities of life in order to make a livelihood, and so we cannot all go to college, hence we have our institutes, a means by which the college comes to us and reaches out a helping hand, and here is where our State Department of Agriculture takes up the work, and broadens and extends the work that has been begun by our general Government. Our general assembly makes an appropriation by means of

which we are enabled to employ men, graduated from our agricultural colleges, and others graduated from the equally important school of experience, who travel all over this broad Commonwealth, to impart instruction to those who wish to learn. The work begins in the fall of the year, just as soon as we have gathered in our crops. When we have our potatoes and our apples and our cider stored away in the cellar, and our fuel is all gathered in, then our institute work begins, and these lecturers travel over the State giving instruction in methods of cultivation, soil improvement, dairying, stock breeding and farm and household economy, which proves beneficial to us all, and this, sir, is the character of the people that you have here to-day. The men who are engaged in this work need to be well equipped, for the farmer is not only a student, but he is an apt student, who not only learns readily but who has the ability to discern between the teaching that is true and that which is false.

I remember that when a few years ago this work was begun in the State of Pennsylvania, there were doubting Thomases in the audience, and not until there had been some progress, until they saw the effect it was having upon our agriculture, did some of these men regard the work favorably, but they are becoming apt pupils now.

These instructors that we send out must be able to keep up with the advances made by their pupils, and sometimes this is no easy task.

I remember when I was a boy of sixteen, I taught a public school to which there came a class of boys and girls older than myself who had been away to an Academy, where they had been studying English Analysis, and had gone through the first book of Davies Algebra, and I tell you, I had a tough time of it to keep out of their way. I think possibly such has been the case in regard to our institute work, but thanks to the energy and earnest devotion of these lecturers, they have kept in advance. They seem to have seen in the very beginning of the work, that it would be necessary for them to keep in advance of their pupils, and that to do this they must labor industriously and they did it, and did it well, and it is due to their energy and fidelity and to the good judgment of our Director of Institutes, Brother Martin, that we have kept up the standard, and we have been able to meet the call for higher training and more advanced work as that call has come.

This, Mr. Chairman, is the character of the people whom you entertain to-day. I am glad to have received this welcome from Judge Smith, and I am glad to be here. I am glad to have the honor of being entertained by the good people of Clearfield and Clearfield county, and when the work of this week has been done, when we have accomplished the objects that have brought us together, and when we go out, as I trust we shall, strengthened for the work in which we are engaged, to our various homes and various fields of labor, I feel sure we shall go cherishing the kindest feelings towards the people of this little city, and (addressing Judge Smith) I hope that you, sir, and the citizens of Clearfield will feel that some little good has come into your lives because of your association with us.

The CHAIR: We have with us this afternoon one of the largest market gardeners in Pennsylvania, one of the men who uses the

most fertilizers of any person in the State, and one of our good old grangers, Brother M. S. Vaughn. We shall be glad to hear from him.

MR. VAUGHN: Mr. Chairman, Ladies and Gentlemen of the City and County of Clearfield: In behalf of the officers and members of this organization, I wish to thank you for this cordial welcome, this fraternal greeting that has just been extended to us by an honorable representative of your city and county; and let me say, my friends, that it affords me great gratification to be able to tell you that he is a product of the soil of my native county. He is one of my boys. We grew up together, I was a little ahead of him; we toiled and labored in the fields side by side. We have eaten at the same table, partaken of the same nourishment, and we have hunted rattle-snakes and picked huckleberries side by side, and that was before the discovery of the antidote of the rattle-snake bite, and we were not provided with it.

I feel proud that I can stand here and realize the predictions that were made years ago, the predictions in regard to this honorable gentleman have been borne out and confirmed. I always predicted that for him, because from a boy to a man, you never found him engaged in anything, countenancing or recognizing anything that did not lead to the highest standard of manhood.

Now I am only here to emphasize a few of the remarks that have already been made. I wish to emphasize a few of the reflections that your worthy Secretary made in reference to this class of people. I want to say to you people of Clearfield that it will not be necessary for you to increase the number of your peace officers or enlarge your present accommodations in your county jail on our account. We can vouch for every man among us with one exception, and if the supply of vegetable matter and cow-horn turnips holds out, perhaps even he will not be an exception.

I want to thank you for this privilege of addressing you. I do not intend to consume much of your time, but I want again to extend to you the thanks of this convention, and all the members of this convention for this cordial greeting and this kind welcome, so ably given to us at this meeting.

(Cries for "Bob" Seeds.)

MR. SEEDS: Mr. Chairman, County Chairmen, Institute Workers, and Ladies and Gentlemen: I want to say to you that I am delighted to meet you people, and I want to take this occasion to thank the county chairmen for the nice way they have treated me in going over the State of Pennsylvania. I also want to thank the Institute workers for helping me to make the institutes a success. As long as I am interested in agriculture, I want to be with you. I am glad to meet you. Since I was a little bit of a boy at my grandfather's knee, I have heard of Clearfield county, and my first impression of Clearfield county was such that I believed that if a whippoorwill would come here, he would have found the conditions such that he couldn't stay over night. I sat at my grandfather's knee when I heard them talk about a farm that he owned in Clearfield county. I heard him tell his boy that he was going to sell it, because he said that the trees were so large it would cost more to take them off the land than the farm was worth; that farm was worth more than—

the coal beneath the surface was, worth more than his farm over in Huntingdon county.

I am delighted to come to your county. I had the pleasure of traveling through this county when I was working for the Deering Harvester Company, and the largest sale I ever made in any one week I made in your county, and I found more summer schools in Clearfield than in any other county I ever visited.

When you talk about Farmers' Institutes, I will tell you that the rest of the counties want to get a skate on, if they want to keep up with Clearfield county.

I want to thank you for the privilege of being with you. I know that Brother Vaughn has talked about my cow-horn turnips; I guess I am known all over the State, if not all over the country as the biggest story teller in the world, but I would sooner be even a good liar than a poor farmer.

The Secretary struck the keynote when he talked about the Institute lecturer keeping out of the road of his pupils. The whole thing hinges on education. I once heard a definition of education that struck me very forcibly: "An education is that which puts a man onto his job." It is just that. It is just so with the architect, just so with the lawyer, and just so with the farmer. I remember a story of a certain man who fell down and struck his nose in such a way on a sharp instrument that it was cut completely off. He picked up his nose and stuck it on again and tied it on with a bandage, and after a while, when he thought the nose had properly healed, he took off the bandage and looked in a looking-glass, and lo and behold, he had put his nose on upside down, and every time it rained, the rain ran down his throat, and every time the poor fellow sneezed, it blew his hat off. He wasn't educated; he didn't observe, or he would never have put his nose on wrong side up. I tell you the whole thing hinges on education, yet often the man who has given us a new idea has been called a crank.

When Fulton built the first steamboat, he had a rich uncle who had money to burn, and the uncle told him it wouldn't do, but Robert Fulton worked on through his rich uncle declined to help him out with a cent. He never ceased his efforts and after his little steamboat was completed and he pushed it out into the Hudson River and rang the bell to go ahead, there was trouble in that little boat and it wouldn't move and his rich old uncle stood on the river bank and said, "Bob, I told you it wouldn't go; it won't go, it will never go." But Robert was not discouraged. He took his wrenches and his tools and he did this and he did that; he adjusted a bolt here and a screw there, did a few things that he thought necessary and then he pulled the throttle open and his little steamboat moved on, and his old uncle stood on the bank and shouted after him, "You'll never get it stopped, you'll never get it stopped!" That is the way it has been ever since the foundation of the world. "It is the man who does the best who gets more kicks than all the rest."

From the register it was found that the following Institute Managers were present:

County.	Name and Place.
Adams,	A. I. Weldner, Arendtsville.
Allegheny,	J. S. Burns, Imperial, R. F. D. No. 1.
Armstrong,	S. S. Blyholder, Neale.
Beaver,	A. L. McKibben, New Sheffield.
Bedford,	H. K. Lutz, Bedford.
Blair,	H. L. Harvey, Juniata.
Bradford,	E. E. Chubbuck, Rome, R. F. D. No. 16.
Bucks,	Watson T. Davis, Ivyland.
Cambria,	H. J. Krumenacker, Carrolltown.
Carbon,	Brice Brinckman, Weatherly.
Centre,	John A. Woodward, Howard.
Chester,	Dr. M. E. Conard, Westgrove.
Clarion,	S. X. McClellan, Knox.
Clearfield,	E. M. Davis, Grampian.
Clinton,	Joel A. Herr, Millhall, R. F. D.
Columbia,	A. P. Young, Millville.
Crawford,	J. F. Seavy, Saegerstown.
Cumberland,	Rev. T. J. Ferguson, Mechanicsburg.
Dauphin,	S. F. Barber, Harrisburg.
Delaware,	R. M. Heyburn, Ward.
Elk,	John B. Werner, St. Marys.
Erie,	Archie Billings, Edinboro.
Franklin,	C. B. Hege, Marion.
Fulton,	R. M. Kendall, McConnellsburg.
Greene,	J. W. Stewart, Jefferson.
Huntingdon,	Geo. G. Hutchison, Warrior's Mark.
Indiana,	S. M. McHenry, Indiana.
Jefferson,	W. L. McCracken, Brookville.
Juniata,	Matthew Rodgers, Mexico.
Lackawanna,	Horace Seamans, Factoryville.
Lancaster,	W. H. Brosius, Drumore.
Lawrence,	Samuel McCreary, Volant, R. F. D.
Lebanon,	Edwin Shuey, Lickdale.
Lehigh,	P. S. Fenstermaker, Allentown.
Luzerne,	J. E. Hildebrandt, Dallas, R. F. D.
Lycoming,	A. J. Kahler, Hughesville.
Mercer,	W. C. Black, Mercer.
Mifflin,	M. M. Naginey, Milroy.
Montgomery,	Jason Sexton, North Wales.
Montour,	C. A. Wagner, Ottawa.
Northumberland,	I. A. Eschbach, Milton, R. F. D. No. 1.
Perry,	A. T. Holman, Millersburg.
Pike,	B. F. Killam, Paupack.
Potter,	Horace H. Hall, Ellisburg.
Schuylkill,	W. H. Stout, Pinegrove.
Snyder,	Charles Miller, Salem.
Somerset,	Jacob S. Miller, Friedens.
Sullivan,	E. R. Warburton, Dushore, R. F. D. No. 3.
Susquehanna,	Dr. E. E. Tower, Hop Bottom.
Union,	J. Newton Glover, Vicksburg.
Venango,	W. A. Crawford, Cooperstown.
Warren,	George A. Woodside, Sugargrove.
Westmoreland,	M. N. Clark, Claridge.
Wyoming,	D. A. Knuppenburg, Lake Carey.
York,	G. F. Barnes, Rossville.

Of the Institute Lecturers, the following were present:

Barber, Spencer F., Box 104, Harrisburg, Dauphin county.
 Bashore, Dr. Harvey B., West Fairview, Cumberland county.
 Beardslee, R. L., Warrenham, Bradford county.
 Black, W. C., Mercer, Mercer county.
 Bond, M. S., Danville, Montour county.
 Brodhead, C. W., Montrose, Susquehanna county.
 Bruckart, J. W., Lititz, Lancaster county.
 Burns, J. S., Imperial, R. F. D. No. 1, Allegheny county.
 Butz, Prof. George C., State College, Centre county.
 Campbell, J. T., Hartstown, Crawford county.
 Clark, M. N., Claridge, Westmoreland county.
 Conard, Dr. M. E., Westgrove, Chester county.
 Cox, John W., New Wilmington, Lawrence county.
 Cure, Z. T., Jermy, Lackawanna county.

Detrich, Rev. J. D., West Chester, Chester county, R. F. D. No. 12.
 Drake, W. M. C., Volant, Lawrence county.
 Funk, Dr. J. H., Boyertown, Berks county.
 Hall, Horace H., Ellensburg, Potter county.
 Harshberger, J. W., Ph. D., Philadelphia.
 Herr, Joel A., Millhall, R. F. D., Clinton county.
 Hill, W. F., Chambersburg, Franklin county.
 Hoover, Hon. E. S., Lancaster, Lancaster county.
 Hull, Geo. E., Transfer, R. F. D., Mercer county.
 Kahler, Hon. A. J., Hughesville, Lycoming county.
 Kester, R. P., Grampian, Clearfield county.
 Lehman, Amos B., Fayetteville, Franklin county.
 Lighty, L. W., East Berlin, Adams county.
 McDowell, Prof. M. S., State College, Centre county.
 Menges, Prof. Franklin, York, York county.
 Northup, Henry W., Glenburn, Lackawanna county.
 Orr, T. E., Beaver, Beaver county.
 Owens, Prof. Wm. G., Lewisburg, Union county.
 Peachey, J. H., Belleville, Mifflin county.
 Phillips, Hon. Thomas J., Atglen, Chester county.
 Seeds, R. S., Birmingham, Huntingdon county.
 Stout, W. H., Pinegrove, Schuylkill county.
 Surface, Prof. H. A., Economic Zoologist, Harrisburg.
 Thayer, Dr. I. A., New Castle, Lawrence county.
 Wagner, F. J., Harrison City, Westmoreland county.
 Wallace, Mrs. Mary A. ("Aunt Patience"), Ellwood City, Lawrence county.
 Watts, Prof. R. L., Scalp Level, Cambria county.
 Watts, D. H., Kerrmoor, Clearfield county.
 Waychoff, G. B., Jefferson, Greene county.

The following visitors were present:

J. A. Farabaugh,	Bradley Junction.
Miss Anna M. Burns,	Imperial.
J. C. Mattern,	Holidaysburg.
E. L. Phillips,	New Bethlehem.
J. M. McKee,	New Bethlehem.
M. P. Hallowell,	Ivyland.
C. O. Mattern,	Osceola Mills.
W. C. Patterson,	McConnellsburg.
Mrs. G. B. Waychoff,	Jefferson.
E. M. Davis,	Grampian.
Mrs. W. L. McCracken,	Brookville.
Mrs. Ella M. Lighty,	East Berlin.
H. G. Supplee,	Bloomsburg.
B. F. Kahler,	Hughesville.
Alex. Stittmatter,	Bradley Junction.

The CHAIR: We will now take up our regular program. The first number is entitled "Anatomy, Physiology, Care and Treatment of Farm Animals," by Dr. E. E. Tower, of Hop Bottom, Pa.

The address of Dr. Tower is as follows:

ANATOMY, PHYSIOLOGY, CARE AND TREATMENT OF FARM ANIMALS.

By DR. E. E. TOWER, Hop Bottom, Pa.

The subject you will notice on the program is a pretty broad one, one that should take up several hours, if we attempted to go into the minute details of what this subject represents. To talk of the anatomy, physiology, care and treatment of farm animals, means a great deal, and at best we can only hint at what I wish you all to fill out for yourselves. The few things that I shall present to-day I hope will be magnified by our fellow-institute workers and that

they may in some cases be able to give the farmer some hint which may save the life of a valuable animal. There may be some little things which I may not think of, and which I would thank you all to ask me about when we come to that point.

(The Doctor had, before beginning his lecture, hung upon the wall two models or charts, one representing in detail a horse the other a cow.)

These two models which I have hung upon the wall you will recognize as models of the horse and the cow. Let us for a few moments consider them as two machines, created for the use of the agriculturist, machines without which agriculture could not exist. To some perhaps this may seem a little overdrawn, but I will go a step further and say, machines without which civilization could not exist.

We all know that with every kind of machinery, there are certain rules to be followed. While there are a great many different kinds of machines, all have a certain motive power, depending largely upon their construction and the purpose for which they are designed. One may have a lever here to move to the right, another may move to the left. One may require steam and another may require the explosion of gasoline or some other substance to set the wheel in motion, but all tend to the same end, namely, to produce power whereby the machine may do the work for which it is designed.

The man who is successful in manipulating this machine must know all the intricate parts. He must know what particular kind of fuel will produce the most power. He must know how much fuel to use and when to use it. He must know that all parts are properly adjusted and that the important bearings are properly lubricated. He must know the limit of speed at which his machine may run without danger of explosion or injury.

(Referring to the model of the cow.) In this picture we have the bones of the animal exposed and you will see here the large number of levers—we will call them levers, bones or levers that are designed to work this great machine which is here represented.

Here we have a representation of the circulation of the blood and the nervous system, showing you how all these veins and arteries are arranged. The blue lines represent the veins and the red lines the arterial circulation, as it is thrown away from the heart. In here you will notice the glands (pointing to the part indicated on model.) Here we have the sub-maxillary gland which is so often diseased with tuberculosis. Pardon me, but I cannot help bringing in that subject of tuberculosis once in a while, because it is something I am very much interested in, and all farmers should be. The gland as represented here is supposed to be in the natural condition, although perhaps a little overdrawn down here (indicating).

Here we have another division. In this we have removed the skin only. This part comes next to the skin and shows the nervous circulation. Here we have the spinal column, looking at it from the front and running all through. All these little white lines are nerves. People sometimes say that the cow has no nerves. Just look at that and see if you think there are no nerves in that cow. No man of any sensibility can look at that and then go home and

bang the cow over the head or hip with the milking-stool. If he does, he hasn't got good sense.

I want to speak of the muscles a little. You will notice the interlacing of these muscles. They act as supports and assist in the operation of all these levers that I spoke of, two hundred and fifty-six in number and they are all bound up here.

Now I want to go a little further on to the digestive tract, and here we have the lungs in their natural condition, and they are colored as near to nature as possible in their healthy condition. However, a great many changes will take place in different diseases.

I want to refer to the lungs. Here is a part that some people have an idea must be affected in order to have tuberculosis. An animal may die with tuberculosis, and the lungs scarcely be affected, simply because some other organ may be affected instead of the lungs. Pulmonary tuberculosis means an affection of the lungs, but there are cases where the lungs are not affected, and still tuberculosis be very apparent.

We cut up the lungs and see in there the bronchial tubes; all these little branches are the bronchial tubes through which the air passes, and is passed from the animals in the respirations from the lungs. Here we have the heart lying right between the lungs in this position. We will cut that heart open and notice its structure. Could you make one of those pieces of machinery? If you did, it would not work. That heart is the seat of the whole thing. Of course all of these have got to work in unison, or else they are no good. If this heart wears out, you can't throw it away and get a new one. You have got to keep it in repair, consequently more care is required to do it than with any machine that has ever been built.

Here you will observe the kidneys in position, showing as nearly as may be their natural color. We will cut this kidney open and see the inside structure of the kidneys. Here we have a representation of the first stomach; the cow is provided with four stomachs. This is called the first or paunch. The horse is provided with only one—I will show you that a little later. Here we have the spleen, and while I am speaking of the spleen, I want to speak of one disease which is a very deadly disease among stock, and one also very deadly to people—anthrax. You probably know what it is, one of the worst diseases that ever was known. In anthrax this spleen will be enlarged from three to four times its natural size. If you were to take this spleen off in the case of anthrax, and if you were to cut into this, it would present a jelly-like, black, tarry appearance. No other disease that we know of can produce that appearance. Then again in anthrax you will find little red spots perhaps on the paunch, perhaps on the intestines. Just underneath the skin, you will find little spots of blood. In blackleg, which occurs in young animals, you always have bloating, very extensive, in anthrax never. Now we will just lay this paunch as we call it open and see what is inside. (Exhibiting and describing inside of paunch.)

Here we have the small intestines. In the cow we have 150 feet of digestive tracts which is twice the length that is in the horse—seventy in the horse, a hundred and fifty in the cow. The horse has one stomach, the cow four, as I have said. Here we have the second, third and fourth stomachs. Here we have the true diges-

tive stomach, and these are laid in position just as they appear in the natural animal. A great many people get peculiar ideas as to where this stomach of the cow lies, and that is I think, a wonderfully nice thing to study, and it is a great help if fully understood, in knowing how to treat them. Here in this stomach (indicating) we have the true digestive part where the food is pressed and agitated, separated, getting out the parts that go to make up the blood and the muscle.

We will go on a little further. Here we have the liver in position with the gall bladder here (indicating). In regard to the digestive organs, here we have coming down through the esophagus or small pipe which you will notice runs between the lungs and in here we have the wind-pipe or the trachea. Now it would not be best if I could, to go on and give you a minute description of every one of these organs or every one of these little nerves and blood-vessels and all those things, but our time won't admit. Here we have the trachea which you see goes into these tubes right here as shown. The air goes through here and then it begins to sub-divide just like the little brooks that go to make up a great river.

One thing I wish to mention, that is, the choking of animals. Hardly a farmer who has not had more or less experience with animals being choked, and this can be remedied to a very great extent, or can be relieved. While animals will get choked once in a while, it can be helped, and I will tell you how the choking will take place, probably up in here (indicating on model), although it may be down here back of the lungs and very near the stomach. I will tell you the simplest thing in the world to do in a case of that kind, and it may save the life of a valuable animal and will not hurt your animal. Take a piece of common rubber hose, you need not use only about six feet of it, and insert that right down the cow's neck; perhaps it would be well to take a card and put this in the animal's mouth to hold her mouth open and run this rubber pipe right down here until you strike your apple or whatever it may be that chokes her. Often it will occur that the apple is so swelled in there, or so firmly wedged as to be difficult to stir. Now step back to your buggy and take your buggy whip and run it down this rubber pipe. The pipe as it strikes the apple will fit around that apple so that there will be no danger of making any hole, and then press the end of your whip carefully down until it reaches the stomach, and when it reaches the stomach, the gas will certainly escape through that pipe so quick that your animal will be entirely relieved in a very few minutes.

Only last fall I was called to see a cow that was choked. I noticed blood dribbling down the sides of her mouth, and I asked the owner of the cow what he had been doing and he wouldn't tell me. I did not blame him; I wouldn't either, if I had done it, but finally he said, "I took the rake's tail and put it down her throat and it went somewhere but she didn't seem to be any better." I said to him, "I can tell you where it went, it went through that esophagus, and into the muscles of the neck which will cause the death of your cow very soon," which it did. The cow died that night. To be sure that he had done the mischief, he cut the neck open and found a slit about six inches long where he had forced the rake

handle through. A drover came along in one case where a cow had picked up an apple—I want to say right here, if a cow gets in where the apples are, do not run them out nor set the dog after them to chase them away. If you go to running them, or chasing them with a dog, they are almost certain to become choked—this drover as I commenced to say, had a nice yearling that picked up an apple and choked on it. They had an old man along with them who, as it happened, had a very large cane, and it was very sharp on one end, and the old man took this cane and jammed it down the throat of the animal and it died in about an hour. The rubber hose is the best thing for relieving this condition, and any man can use it, and if you institute workers will convey this knowledge to the farmers as you travel over the State, it may be the means of saving a valuable animal, and if I can be the means of saving the life of one animal of that kind, I shall feel that I have been well paid.

There is another subject which I want to mention, and that is dehorning which is quite common at present. I am not going to say whether it is best or not. The farmer knows better than anybody else whether that animal should be dehorned or not. If the animal is ugly and unmanageable, I would certainly dehorn it. Now as you have probably noticed, there is bleeding after dehorning. You see the little arteries that come up in here (indicating on model) come up to the horn very closely to the edge of the gland that goes to the horn. Now the bleeding never comes from the inside of the horn, but it comes from this little facial artery that curves up very near and then goes back in here and in cutting it off, most of men cut a little of the skin—in cutting it off you often clip that little artery. I was called out to see one the other day. It had bled more than a painful, and the man had a ball of cotton batting wound around the cow's head. Now when you get a case of that kind, keep cool; don't get excited; just go to that cow and see where that blood comes from. You will find just as I have told you, that it comes from the outside of the horn, right about there (indicating on model) you will find a little artery which will spurt right up. Now take your thumb nail and hold it for half a second or so there, and in nine cases out of ten it will stop it at once. Any little thing that will shut that together just for an instant is all that is necessary, and the bleeding is all stopped, but do not try to bundle on a great lot of cotton batting; that only soaks the blood up after it comes out.

In dehorning, never leave the hole open in the horn. Nearly all our cattle are subject to hollow-horn. You will find there is an immense opening at the stump of that horn after it is cut off, a very good idea, as was once suggested by our worthy Secretary, take a piece of cotton cloth about the size of that (indicating the size) spread a little tar on that and put it over the hole. That hole runs directly down to the head, and connects with the nasal passages, and if you will take pains to examine, you will find that the breath will spurt right out of that hole.

(The doctor now passed over to the model of the horse.)

Here we have the bones. You will notice that in the horse the bones are a little more compact than in the cow, for the horse is a beast of burden. In this we have 256; in that, 251, the main difference coming in this part of the animal. (Indicating.)

In here you will notice that the circulation as compared with that is perhaps a little stronger; the veins and arteries are a little bit larger, and the circulation in here is of course a little different on account of the difference in the organs. There is a little thing I wish to speak of right here. I wish to speak of bleeding or hemorrhage. It is quite often that the farmer meets with an accident either in plowing or harrowing or some other work, and an artery gets cut. I saw a case where a man struck his horse with a whip, and the whip struck this artery and cut it open, and the horse of course bled terribly. And in another case only a few days ago a horse run away and cut the artery right in here so that it bled terribly. In this case, the owner of the horse called me up on the 'phone. He said, "You can't get here before the horse will die, and he is a very valuable horse; can't you tell me something to do?" I said, "Yes." I told that man to take a little stick about as big as a lead pencil or a little larger, about like that (indicating) and put his hand around the leg until he came to the point where the blood starts then take the stick and lay it over that point, and take a little cotton cloth bandage and wind around it, and he would stop that bleeding simply and easily, which was done.

I will tell you what they will do in most every case. They will take a big string or small rope and twist it up until they nearly cut the skin through, and in fact, I have seen cases where the skin has been cut entirely through by this cord, and the blood kept coming just the same. Now it is nature's privilege to put these arteries in a little groove, and you may tie a string around there tight enough to cut the skin clear through, and you won't stop the bleeding; but take a cork and put it over that spot and you will stop it. You see the idea is to get a little pressure onto this point.

A Member: Mr. Chairman, just there, if you please, I would like to inquire of the Doctor how we shall know the difference between the veins and the arteries.

DR. TOWER: I will say in reply, that you will notice here the blue lines represent the veins, or the venous blood; the red lines represent the blood, the purer blood which is going down this way (indicating). You can tell by the color of the blood which one you have got, whether it was from a vein or an artery. You would scarcely get very little bleeding coming up here, (indicating) however, I would recommend that you use a stick long enough or a cork, or whatever you have, to cover both ends, and then do not put on a bandage tight enough to give the horse any pain, and this you will find will work in almost any part of the body, and it is something that you all know, that requires prompt attention. If a man has a horse or a cow that has a sudden hemorrhage or bleeding, it requires prompt attention. At one place I saw a man faint away just from seeing the horse's leg which was cut. Of course there are men of that kind, that can't help it. I don't blame them. You will notice all the blood circulation that goes around the head. There are some little ones, too, that are not shown on this model, so you can see how liable they are to be injured.

The SECRETARY: Mr. Chairman, may I ask the Doctor through you, to kindly tell us how to take the pulse of a horse.

DR. TOWER: The pulse can be taken very easily. You have the pulsing of the vein and artery both. Any place where you can

press the artery upon the bone, you can feel the pulse, but this is the most convenient place, right up there against this jaw bone. I would recommend you to practice that in health as well as disease; learn what is a quick pulse, a hard pulse, or a slow pulse—learn the variations from the normal.

Now you will notice that in the muscular system the muscles are a little bit more marked, that they are a little more spread out than they are in the cow; that is to say, they are not blended together quite so closely. Now I want you to look for a minute at this limb. Then you will notice another one that goes from here and runs down through here and passes on front here. They are all put in there for a purpose. No machine that was ever built could have all these levers working in such perfect harmony as in an animal of this kind. Then you look down here to the binding ligaments, and you will find another that works always in unison. There is no side-pulling of any of these muscles in health. When you come to study these all over, it isn't anything strange that a horse gets lame; it is more wonderful that they are not lame all the time, the way they are used sometimes.

Now we will go on with the digestive organs. Here we have the lungs, which you will notice are not as large as they are in the cow in proportion. There is a disease known as heaves. Now what I would do in a case of heaves, or what the cure is for heaves, I am often asked? When you read an advertisement promising to cure heaves, or a man tells you that he has a medicine that will cure the disease, you want to be on your guard, because I am here to say to you that no man on earth can cure heaves except by putting in a new set of lungs, which I do not want to undertake. Now what causes heaves? You notice these little black lines running along in here; they represent the different air cells of which the lungs are made up. In heaves there has been a rupture of these air cells. Two or three have been made into one. That is what causes the noise you hear. It is a rupture of the air cells and nothing else.

A Member: Mr. Chairman, I would like to inquire of the Doctor what causes heaves.

DR. TOWER: Heaves are caused sometimes from feeding too much coarse, dry feed. It may be brought on when a horse has been, perhaps, lately fed, and then is started off on a fast run, so that the air is forced so violently through the lungs that the walls of the cells are not able to withstand the pressure and they burst through. Of course dry, dusty feed may cause the same effect.

You will notice in here that the bronchial tubes are a little heavier than those of the cow; then again you see that the shape of the heart is a little bit different. You will notice the position of the heart; it lies right behind the front shoulder. I had a man the other day say, "Just look at that horse's heart beat," when the horse had the thumps, and the beating was located back here (indicating). Now you know that thumps may be described as spasm of the diaphragm, the heart has nothing whatever to do with what we call thumps. If you want to test that, put your ear to the heart and put your hand on the spot where the thumping is going on, and you will find that the heart beats with one motion and the

thumps with another, showing very conclusively that the heart has nothing to do with it.

Here we have the stomach of the horse (pointing to same on model) which you see is very much different from what it is in the cow. It may be described as a large storehouse which contains all the feed which is there manufactured into the various substances which the horse requires to support his life and strength as a beast of burden.

MR. FENSTERMAKER: Mr. Chairman, I would like to ask the Doctor what is the cause of thumps.

DR. TOWER: Well, if you will tell me what is the cause of hic-coughs in a man, I will tell you what is the cause of thumps in a horse. It may come from different sources. It may come from a tired condition, from a condition in which the nerves have been irritated so that they jump irregularly; any little irritation, whether it is from over-exertion, or from over-thirst or over-driving, any such thing is often the cause.

MR. SEEDS: Mr. Chairman, I would like to inquire of the Doctor what he would recommend as feed in cases of heaves.

DR. TOWER: I would recommend in heaves that you restrict the dry feed; don't give the horse dry or dusty feed. Moisten the hay and don't give them too much of it. You will find that moist feed will be quite a help, then in addition to this, as a medical aid, I would give perhaps powdered licorice root, about a teaspoonful of that on the tongue. I would prefer it on the tongue because it then goes into the throat and into the bronchial tubes. Again, the oil of tar is recommended.

MR. SEEDS: Mr. Chairman, I would like to ask the Doctor whether in such cases neatsfoot oil would be helpful.

DR. TOWER: Yes, in small quantities.

A Member: Is it not a fact that there is less of that trouble now than there was in former times.

DR. TOWER: I think so.

MR. SEEDS: Mr. Chairman, I would like to make another inquiry of the Doctor. We had a veterinary down to our place looking at a horse in a case where the horse declined to eat, and they didn't understand why, and he showed me where the inside of the horse's mouth was all cut and bloody, which was caused by a sharp tooth, a ragged edged tooth.

DR. TOWER: The teeth of a horse are the great instrumentalities which prepare the food for digestion and mix it with the saliva. Such a condition as you describe is quite common and it has not got to be an old horse either; sometimes the teeth on the outside of the upper jaw become elongated and very sharp. The upper jaw is somewhat wider than the lower jaw and those teeth will become sharp which will sometimes result in the sides of the cheeks becoming lacerated. Now if there is a rubbing of the cheek on a

sharp tooth until they become lacerated, you will be apt to find as a result that the horse will not eat. Only a little while ago a man came from about twelve miles away to see me and he said, "There is something the matter with my horse's tongue." I opened his mouth and turned the tongue up, and in that tongue was a gash at least an inch and a half long, which was full of oats and feed that had lodged in there. When I came to look on the lower jaw and examine the teeth, I found there was a sharp tooth which had cut the gash in the tongue.

MR. ORR: Mr. Chairman, I would like to inquire of the Doctor if he can show us from his diagrams how to operate on a cow bloated from clover.

DR. TOWER: Yes, I can tell you how it is done and give you a very reliable remedy. Here you will see the ribs are shown. You can see here on this diagram where the ribs begin. Now just about half way from the hip bone to the ribs is the proper place to operate with a trochar—about as far as from the top of the backbone—for instance, it would be about there (indicating).

MR. SEEDS: On which side?

DR. TOWER: On the right side.

The SECRETARY: How do you point your trochar?

DR. TOWER: You will find there will be spots where it will be puffed up, perhaps a little more in one place than in another, and that will enable you to judge; as I say, about at this point (indicating) is right.

A Member: Wouldn't it do to use knives?

DR. TOWER: It has been done with knives, but I would not like to use knives.

If you stick a knife in here you are taking chances that I would not like to take, as the stomach is acting right along, and you may do a serious injury. If you take a trochar and insert it through there as I have indicated, it will be safer.

A Member: If you take a knife and insert a tube, wouldn't that do?

DR. TOWER: Yes, that would be all right; but before you put that tube in, they may be an inch apart—those two holes—on account of the motion.

DEPUTY SECRETARY: Mr. Chairman, we have fifteen minutes to devote to this subject, so that it will be necessary to make the questions brief.

MR. HOOVER: What is the cause of a horse having the habit of stall kicking when he is perfectly safe with a driver?

DR. TOWER: Well sir, I couldn't answer that, nor any other man, safely. I will answer that in this way: I know a gentleman who will go out in company and he is the nicest gentleman you ever

saw, and when that man gets home he is the biggest kicker you ever saw. Now I have an idea that horses are a good deal the same way; there may be a little skin trouble, a little irritation somewhere, so that when the horse is standing, it causes him to act in that way. It may come simply from a habit.

MR. SEXTON: Doctor, in case of tuberculosis—you spoke of animals dying from tuberculosis when the lungs are not affected. Now then, what I want to know is this: Would the flesh be as badly affected if the lungs were not affected, as it would be provided the lungs were affected, and your animal had tuberculosis badly.

DR TOWER: The flesh would be bad under any conditions. Where animals become emaciated from tuberculosis it does not matter that the lungs may not be affected, the meat is bad in all such cases. Take the liver, for instance, the liver is one of the main glands of the body, and if that is affected, it will produce the usual evil result. It does not matter what organs are affected, if the disease is continued and is generalized, the meat is certainly bad.

We have some cases where the meat has been found to be wholesome, where the disease is confined to one little spot, perhaps, or two, but has become insistent, so that the germ is not strong all through the system.

A Member: What causes spasmodic colic?

DR. TOWER: It may come from different sources, from overwatering or feeding or a change of feed, anything which irritates the delicate mucus membrane may cause spasmodic colic. When the stomach is not doing its work properly, when conditions are such that the food is not digested properly, you are liable to have spasmodic colic.

The SECRETARY: Any nervous excitement will reduce the power of digestion, and of course that may produce colic.

Dr. Tower stated in answer to an inquiry as to a remedy for colic, that you should give a horse affected with colic equal parts of ginger, gentian and bicarbonate of soda.

A Member: Do you advise the feeding of ground grain to a horse, and if not, why not?

DR. TOWER: I will tell you why I advise feeding ground grain in some cases, and then I can tell you why and when I do not. If you have a horse pretty well along in years, it is a little better to aid his digestion by helping him grind it. You can take another horse, equally as old and ground grain does not agree with him. It is just as I said in the beginning, you have got to study your horse. I would like to have ground feed as a rule for horses that are working, and I would feed oats and corn with a little bran mixed with it, increasing the meal proportionately as you increase the heavy work.

MR. ORR: Would you use some molasses with that ground feed?

DR. TOWER: I am not much of an advocate of molasses as feed.

A Member: How about ground linseed oil cake?

DR. TOWER: I am not much in favor of it.

MR. BEARDSLEE: Doctor, can you describe the process of milk secretion and its delivery into the udder?

DR. TOWER: I haven't the time to do that.

MR. BRODHEAD: Doctor, in reference to a horse not having their teeth in proper shape, is not that the cause of colic in a horse?

DR. TOWER: In about eight cases out of ten, I would say that colic comes from bad teeth.

Now I will not detain you long but I have a little more to present to you in the paper that I have prepared. Referring again to the cow, let me say again that she is the most complicated piece of machinery that was ever built. If this be true, then the man who takes upon himself the care and management of this animal, must be a machinist of the highest order. He must be able to select, or in other words, build up a machine that is capable of earning more than it consumes. He must know what kind of feed or fuel, if you please, to use in order to get the power. The man who runs the steam-engine has only the one machine in his charge, and when once he is become acquainted with its workings, he has mastered the situation. If a certain part of the machinery breaks or becomes worn by use, duplicate parts can at once be obtained. Not so with the dairyman; he may have forty or fifty of these complicated animals in his charge, and no two require the same treatment or care. The farmer may study the needs of one cow and be able to say for a certainty just what she requires to keep her in perfect condition and at the same time pay the most profit, but when he comes to cow No. 2, he finds another problem and so on through the herd.

If we were to go to the National Museum and see the first locomotive that was built and compare it with those of to-day, we would scarcely think they were made for the same purpose. Exactly so with the cow; her outward appearance does not present such a marked contrast, but her earning capacity has been greatly increased. We can remember when a cow that could make one pound of butter in a day was considered a wonder. Now if a cow will not make four or five pounds in a day, she is no good.

Years ago anything that had a head and horns on one end, a leg on each corner and a tail on the other end, was a cow, one just as valuable as another. Nobody knew what amount of butter fat her milk contained. Nobody knew or cared what a balanced ration was.

What has caused the change? It has not come by chance, it has come by close, hard study, by experience, by using the different kinds of food to see which would produce the most milk. A few years ago, if a cow sold for \$100 it was considered an exorbitant price. Not long ago H. D. Roe, of New Jersey sold Aggie Cornucopia Pauline for \$5,500. You may say this is simply a fad; if so, then

why not devote a portion of our farms to raising fads? Those who have studied the wonderful mechanism of the animal frame cannot fail to admire the marvelous structure, exact proportion, and given use of every part, and to realize the fact that only a Supreme Being and an All Wise Providence could have brought into existence such a masterpiece of creation. To abuse such beneficence is no light sin; to keep the structure in repair is, to the right-minded man, a sacred and pleasing duty.

The subject of health and disease, if dealt with from a practical point of view, must of necessity occupy a very wide range. Health is known as that condition of the body in which every function is performed in a natural and proper manner, where each one acts in harmony, without deviation. As in human beings so in animals, a varied condition of health may be present.

The different breeds of animals, for instance, are marked by peculiarities of health, and this is readily accounted for by the great number of external influences to which the body is exposed. A due supply of proper food, a sufficiency of pure air and water, a certain temperature, light, shelter, cleanliness, exercise; these and their opposites, separately or variously combined, are in constant operation to promote, impair or modify health. These in themselves have an important influence on the condition of those even whose bodies are originally free from defect. Animals have been too much left to the tender mercies of those who are utterly ignorant of their structure, the true nature of their ailments and the proper treatment of them. True, at the present day reformations have taken place, but we are, nevertheless, constrained to admit that deficiencies do exist and disease continues to be nursed.

The amount of disease due to sanitary neglect has been and still is immense. A defective drain, an ill ventilated cowhouse, a damp or exposed sheepfold, a badly constructed stable, are often the unsuspected roots of many fatal maladies. Prescribed medicines are given and advertised, cure-all drug chests are ransacked to remove the effect while the cause is allowed to remain undisturbed. The old proverb "An ounce of prevention is worth a pound of cure," still holds good. The evil influence must be avoided, or disease still continues to exist.

Unfortunately some form of disease is ever present in this country. Perfect immunity, so far as history shows, never has been, and it may be reasonable to suppose, never will be known, so long as animals exist; however, we have the means within our reach to lessen mortality and in many instances to altogether prevent animals from contracting disease. It behooves us to keep a careful lookout for predisposing causes, and when discovered, to avoid them as far as possible, and when unavoidable, to adopt means whereby they may be modified.

There are many diseases over which medicine has very little control, but the cause of which, when ascertained, may be avoided. By detecting a spark, before it is fanned into a flame, we may, in some cases, be able to eradicate all that is mischievous or dangerous.

The CHAIR: The next number upon our program is entitled, "Commercial Orcharding." We will now have the pleasure of listening to Dr. J. H. Funk, of Boyertown, Pa., who will talk to you on this subject.

Dr. Funk presented his paper which is as follows:

COMMERCIAL ORCHARDING.

By DR. J. H. FUNK, *Boyetown, Pa.*

On seeing this heading, the first impression is, that it means a large apple orchard planted for commercial purposes. Yet it may just as reasonably mean a peach, pear, cherry, or plum orchard, as all of these are planted on a very large scale, covering hundreds of acres, and are therefore classed as commercial orchards. Either of these might be called an apple orchard, without having a single apple tree in them, as the term apple means fruit in general, especially all that of a round form.

That king of fruit, the apple of our day, belongs to the genus *Pyrus Malus*. It is supposed to have its origin in Europe. Pliny mentions twenty-nine varieties of apples being cultivated in Italy about the beginning of the Christian Era. It is doubtful if one of these varieties exist at the present time. They have disappeared, and are superseded by newer sorts, of higher merits. Evolution, constant change, is the law of nature. In this country the majority of our choicest fruits have originated by chance, by the accidental crosses of good varieties, by the intervention of insects, the honey-bee being one of the great factors in cross-pollinization. To this industrious little friend do we owe a debt of gratitude for its instrumentality in giving us many of our choicest and most delicious fruits, as well as the thousands of beautiful flowers, with their bright tints and sweet perfume, rendering our homes a paradise.

The apple, though introduced into America from Europe, has gone through so many changes that the majority of our cultivated varieties to-day are of home origin, showing that our seedlings, grown and acclimated in America, are much better suited to our conditions than are those introduced from other countries.

The adaptation of varieties to location is of great importance. Of the hundreds of varieties of American origin which are grown in the United States, but very few are found in the commercial orchards of any one State.

Varieties that are commercially most valuable in the New England states are not profitable in Pennsylvania; and many of those of Pennsylvania are worthless in Arkansas. The Wealthy which is a fine winter apple in Minnesota, is a very poor summer apple below latitude 40 degrees. Just now numerous varieties of apples and other fruits are coming rapidly into existence, and many of them very valuable to the localities where they originated. These facts have given great impetus to the intelligent breeding of varieties and the selection of bud variation that show particular adaptability to any given locality. The individual intending to plant a commercial orchard should bear this in mind, that all fruits mature earlier by moving them southward, and later by planting them farther north. If he lives in latitude 40 degrees, he cannot profitably plant Baldwin, Greening, Northern Spy, and such varieties especially adapted to latitude 42 degrees; but he can safely

plant many varieties that originated farther south, with the assurance that their season will be lengthened. He should also bear in mind that altitude is a factor of considerable importance.

To be successful in fruit growing, several very essential things must be observed:

LOCATION.

In setting out a home orchard, convenience to the buildings takes precedence. Any piece of land lying adjacent to the buildings and not too wet, is given preference. But for a commercial orchard it becomes a business proposition, which means success or failure; therefore, location is looked into carefully. Never take a low, flat-bottom land on which water stands part of the year, or through which a slow sluggish stream runs, the danger of winter killing and late spring frosts is too great. Select a gentle, sloping hill-side in preference. Cut away all close surrounding forest. Many think a windbreak on the north and west will be a great protection. Have you not noticed the terminals and bloom always suffer most, close to the wood and in the valleys, because they interfere with air-drainage which equalizes the temperature, lessening the danger from frost during the blossoming period? We never fear frost on a windy night; so where we have good air drainage, the air, as it becomes cool becomes heavier, and runs down the same as water, to be replaced by the warmer air from below. This causes an agitation of the atmosphere, and removes the danger of frost. A thermometer placed at the higher point registers considerably higher than one placed at the foot of the hill. The meadows and valleys will be covered with frosts, when but a few feet higher none will be visible.

Exposure.—Opinions differ greatly; some advocate a southern exposure as being less liable to injury by our severe winters; others prefer a northern exposure, claiming it retards the flow of sap in Spring, preventing the buds from starting should there be several warm days during March, which if followed by severe cold, would freeze the tender buds. I have every exposure, N., S., E. and W., in my apple and peach orchards. I find no difference in time of blooming or danger from cold, as I have had no failure so far in 35 years from any of these causes, on any exposure. It all depends on the condition; if your trees are well fed, cultivated, pruned and attended as they should be, you need not fear damage or loss, unless the winter is unusually severe, reaching 20 to 30 degrees below zero.

SOIL.

The apple is a gross feeder, but adapts itself to circumstances. It thrives upon our mountain ranges; in the limestone valley on the sandstone and shales; upon the alluvial deposit in our river bottoms; the vast prairies; from the granite hills of New England, to latitude 32; from the Atlantic to the Pacific Coast; the apple does well, but all varieties do not thrive equally as well in all these locations. Every locality has some particular variety that seems especially adapted to that section. And it is important that the orchardist familiarizes himself with the nature and habit of each variety, that he may select such varieties as are best adapted to

his climate and soil: therein lies the profit. There are many soils in every district so entirely unsuited in the condition we find them, that it would be folly to plant any variety; but in very many instances the objectionable features may be entirely removed, or changed. Compactness, may be overcome by mechanical means by the application of humus, exposure to the elements; missing elements may be supplied; excessive moisture may be removed by ridgeing, or by underdraining, thus carrying off all surplus.

Soils that are porous, permitting the surplus water to penetrate, are most suitable for orchard planting. These may be designated as gravelly, sandy, or sand loam. Others are more compact, made up of finer material, clay, which permits the water to penetrate very slowly, and requires very different treatment. By back farrowing, throwing up a ridge upon which to plant, or by underdraining and turning under plenty of material to make humus, this soil becomes more porous and becomes peculiarly adapted to the production of certain varieties of apples, as certain apples do much better upon clay or clay loam; others upon limestone, granite, etc. One variety may give abundant crops of the choicest fruit upon a granite formation, and be utterly worthless upon a shale, or sandstone formation. Therein lies the value of understanding the individuality of the different varieties.

Preparation.—This should ordinarily be begun the season previous. If the soil is lacking in humus, which is the foundation of fertility, it should be well covered with good stable manure, thoroughly and deeply plowed, and planted to some hoed crop, corn or potatoes, the latter being the better. Apply complete fertilizer of high grade, at least 1,000 pounds per acre. As soon as the potatoes are removed, sow to cow peas, or some other quick growing crop; this may be turned under late in fall, or left as a winter mulch on top and turned under early in spring, plowing not less than 10 or 12 inches deep, harrow thoroughly and roll, which places it in excellent condition for planting.

Selection of Stock: What Age?—If peach, never take a tree over one year from the bud, but good, strong, healthy stock, 4 to 6 feet high, with clean bark, clean roots, free from root galls.

If apple or pear, select one year old in preference, if you can get strong 4 to 6 feet whips. The reason for this choice is, when you get trees of this size at one year old, you have trees of strong, robust habit, strong individuality, the very cream of the nursery. They can be dug with less injury to the roots; you can form the top at any height you desire; you can form a head any shape you wish, having no forks, which should be avoided, as they are apt to split when they are heavy laden with fruit. It is almost impossible to get trees with heads formed in the nursery that will suit the orchardist who understands his business.

If you cannot get one year old trees as described, take smooth, thrifty two-year old trees, that have low, well formed heads. It is advisable to place your order early with some reliable nurseryman, or dealer, before his stock is reduced, as too many will substitute rather than lose the order, and substitution is what you wish to avoid, for if you have made a careful selection of just what you want, you want that order filled to take the letter, and do not wish to have some worthless variety, which the nurseryman says is just as good,

(because he happens to have a surplus of that variety), palmed off on you.

As to Varieties.—Make a canvass of your neighborhood, see what varieties are regular bearers, of good sized showy apples, of good quality. Make inquiries of some one who is well versed, on fruit suitable to your locality. No matter how good an apple you get, if it be a poor bearer, leave it alone; on the other hand, no matter how good a bearer a variety is, if it lacks quality and beauty, do not plant it. The time has come when people's tastes are becoming cultivated, and such apples as Ben Davis, etc., are not wanted.

In selecting varieties, if for family use, have a succession, from early, until late. You can have apples the year round.

If for commercial purposes, do not plant too many varieties. Plant a limited number of select fall varieties, as there is a time when choice fruit is scarce, and brings high prices. These can be supplied by planting Jeffries, Gravenstein, Summer Rambo, Wealthy, and Smokehouse, all choice fruit of highest quality, trees hardy and heavy producers. These are followed by Hubbardston, Nonesuch, Jonathan, Grimes' Golden, Kinnard's Choice.

For winter, plant heavy of Stayman's Winesap (of this variety you cannot plant too many), York Imperial, Rome Beauty, Salome, Nottingham Brown, Nero, Mammoth Black Twig. If you are planting north of 41 degrees, you can add Baldwin, Greening, King and Northern Spy. There are many other excellent varieties in every locality, but from those given the planter can make a selection, that for productiveness, quality and profit, cannot be excelled.

When Shall We Plant?—We can generally get the best stock in the fall of the year, more likely get varieties we want; we also have more time at this season, and the work is apt to be done better. For the hardier fruits, such as apple, pear, cherry, etc., also currants and gooseberries, I believe this is the best season, giving the roots, where cut, time to callous, and often start new roots weeks before the leaves appear, and are thus better able to overcome the severe shock of transplanting. When planted late in the spring, the buds expand and leaves form and often pump out the stored up vitality, faster than the mutilated roots can furnish moisture and food; then should a dry season set in, as it so often does, the tree suffers very severely and frequently dies.

How Shall We Prune?—First, the roots that are bruised and mutilated should be cut back, leaving stubs from 3 to 6 inches. Anything beyond 6 inches is superfluous. The Stringfellow method of pruning, if you are north of latitude 38 degrees, leave it alone; enticing as it may appear, failure is almost inevitable.

Cut all tops back proportionately, if one year old apple and pear. Cut back to two feet stubs. If two year old, with tops already formed, cut limbs back to mere stubs, cutting off immediately above an outside bud, so as to give it an open spreading head. On visiting my orchards, both apple and peach, the visitors' attention is first attracted to the spreading open heads, and they wonder how I get them so. Care in pruning is the whole secret. A good sharp knife is a wonderful instrument in the hands of an intelligent, practical horticulturist. As you can prune for wood growth, prune for fruit, early bearing and many other things.

PLANTING.

Never plant in sod, unless you wish to utilize a steep hillside or rocky piece of ground. If such is the case, then dig large holes, placing the surface soil on one side, the subsoil on the other. Set the tree about one inch deeper, than it originally stood, putting the good surface soil, supplemented with bone meal, in below and over the roots, filling the poorer soil in above. Mulch the ground heavy with straw manure, to keep moisture, and the surface loose, also to furnish fertility. If the ground is plowed and in good tilth, then open deep broad furrows with plow, and plant the young trees therein.

Distance.—A great diversity of opinions exist as to the proper distance trees should be planted in an orchard. Many plant 40 feet apart, claiming when mature, the tree needs all this space for the spread of its roots in search of food, also giving room for the limbs to spread, giving plenty of circulation of air and sunshine, that fruit grown on such trees bring better fruit, of brighter color and higher flavor. Others claim that this distance is unnecessary, that 30 feet is far enough for any orchard, and more a waste of land.

In many commercial orchards they plant 35 to 40 feet apart for permanent trees, then plant fillers between, making three fillers for every permanent tree. In the large Western orchards this method is in vogue, planting such varieties as come into early bearing, such as Missouri Pippin, Grime's Golden, Wealthy, etc. In sections where the peach does well, peach are planted as fillers. After these fillers have borne several crops, or when the trees begin crowding, the fillers are removed, giving the entire space to the permanent trees.

I am frequently asked whether it is advisable to plant fillers. It is doubtful if apple fillers ever produce sufficient before removed to pay for care and expense. With peach it depends on the man, whether he has the moral courage to cut them out in time to prevent injury to the permanent trees, especially if said fillers are paying \$10.00 to \$15.00 per tree. I have gone through this and know whereof I speak.

I think 35 feet is about the proper distance for apple; 25 feet for pear; 20 feet for peach, plum and sour cherry.

CULTIVATION.

In former times cultivation was thought unnecessary, but clean culture is now acknowledged best by all intelligent fruit growers. During the early stage of an orchard, if the lay of the land permits, and the owner prefers, he may plant some hoed crop for a few years, applying plenty of fertilizer to keep up the fertility of the land. But, if not financially necessary, the best results can be obtained by clear culture in the spring, then sowing to some leguminous crop to mulch the ground over the winter, to be turned under in the spring, which adds humus and breaks up the mineral elements in the soil, appropriating them to its own use, to be returned to the soil in a more available form, abstracting large quantities of nitrogen from the air, and thus enriching the land. When the orchard comes into bearing, the raising of leguminous crops cannot so well be done. Then it is best to seed to grass and leave this cropped short, keeping all clippings on the ground. Or the land may be

mulched by hauling foreign matter, as spoiled hay or straw, on the ground. The best showing I ever had from mulch was from a three inch covering of second crop clover hay, after the seed had ripened. The seed kept reseeding the ground for several years.

For peach, I prefer the dust mulch, going over the ground both ways in early spring, while the ground is loose, with a sharp spring tooth harrow. This can be done even when trees are so large that the terminal shoots meet, by dividing the harrow and placing a steel frame between the two sections, thus enabling the team to pass through the middle, while the harrow passes under the limbs, close to the trees. After the land is broken loose, the cultivation is continued with a three section spike tooth harrow, taking a full width space with one passage. This is kept up two to four times a week until in July, always keeping a dust mulch, never leaving a crust form, the cultivation not to exceed three inches in depth. The drier the season, the oftener you cultivate, as you thereby prevent evaporation and retain the moisture for the use of the tree. This may, in dry season, be continued until the 10th of July; but continuing later will be detrimental to the tree by keeping up the growth too late to properly mature its wood, then should the winter be severe the tree suffers greatly.

Thinning.—This is very essential for successful, profitable fruit raising. Trees frequently set so much fruit, that if left, will so impair the vitality of the tree, that the present crop fails to attain its full size and flavor; also fails to make the necessary wood growth and develop good strong buds for the following season. It frequently happens such a tree sets sufficient buds showing abundant bloom the following spring, but, lacking vitality, drop without setting fruit. The fruit matured lacks in size; frequently one-half develops, the other half stops growth when half-size, remains insipid and tasteless, whereas if three-fourths had been removed when less than one-fourth grown, the remainder would have increased in size, yielding as many bushels of fruit, of superior quality, bringing three times as much money to the producer. Choice fruit never gluts the market. It is the poor, insipid, worthless trash that ruins the market, as well as impairs the health of the consumer. It is not the edible part that reduces the vitality of the tree, but the seed. The edible part is made up largely of water. When you reduce the number, the tree having so many less seed to mature, throws all its energy into developing the pulp or edible part, and stores up all surplus vitality in good strong buds for next season's crop, thereby giving you a full crop every year. An off year is not in accordance with Nature's plans. If one fails to materialize (unless something unusual, such as a severe freeze in blossoming time, or a continual rainy week while the tree is in bloom, occurs), something is radically wrong, showing gross mismanagement. Many may think this is unavoidable, but a tree properly pruned, sprayed, fed, etc., is able to withstand hardships that would be fatal to the tree neglected, as most trees are. I know whereof I speak, not having a failure in a fruit crop in thirty odd years.

INSECT ENEMIES.

These are the bane of the fruit raisers' life; and there are so many of them. Fifty years ago a large proportion of these pests

were unknown, or in such small numbers that little damage was done; but, with the importation of new fruits and vegetables, these different insects were imported with them. We have the San José Scale from China; the Codling Moth from Europe; and many others that time will not permit us describing. But these two are the most dangerous, and unless the orchardist fights them with the most approved machinery and the best insecticides, he had better give up and leave fruit raising to the man who has the brain and push to do effective work.

Remedies.—During the last few years so much has been written, talked about, demonstrations held throughout this and other states about the San José Scale and how to control it, that there seems little more to add. Formulas have been given by the score; lime, sulphur and salt, cooked and uncooked, by kettle and steam, how to apply it, and when to apply it; oils, soluble oils, emulsions, soaps, etc., have been extolled. One would think the little insignificant pest would have surrendered long ago, yet strange to say, there are still a few left, enough to make it interesting.

Why is this apparent lack of success? There are several reasons, such as poor material, poor machinery, poor man. The two principal causes are poorly prepared material and poor application. The average farmer is so used to doing things in a careless, indifferent way, he thinks a few small details left out will make no difference in final results, so he wastes a little time, a little money, and accomplishes nothing; then "cusses" the professors, scientists, and specialists as a set of imposters. Lime, sulphur, and salt is now conceded, when rightly made, to be a sure remedy.

Its Time of Application.—Instructions are given to apply any time after foliage drops until buds expand, some advocating fall to be just as good as spring. Do you know that term "just as good" disappointed many a man? The fall is all right for the apple and pear, but for the peach it is dangerous. This past season hundreds of peach trees sprayed in October and November were seriously injured, not only the buds but the new growth? Last fall I sprayed about two hundred peach trees. I can estimate my loss at not less than \$100.00 on this season's crop, and a greater loss in future. The injury shows at a distance; trees full of dead limbs; all bearing wood inside the tree killed; high limbs that received less of the spray are alone producing their full crop. The symmetry and productiveness of the tree is destroyed. Too much care cannot be taken, to give no advice, unless it has been tested, what is food for one, may be poison for another.

The man who abuses a confidence should be held criminally responsible for his neighbors' loss. If such were the case, there would be less rubbish published in our papers.

The Codling Moth.—There is more loss to the fruit grower from this insect than from any other insect we have. The loss annually can be estimated at millions of dollars; yet the greater part can be saved by judicious spraying with an arsenical poison, just after the petals fall, and again a few days later.

Fungi can be treated by Bordeaux mixture, combining the two and applying at one operation.

PROFITS.

I have left this important item for the close. Yet it is one of such vital importance to the individual about to embark into any enterprise. Does it pay? Can it be made to pay that it should be a first consideration? In answer to these questions, I will say for the intelligent, industrious, painstaking man, one possessed of good business traits, there is no other business enterprise that offers such sure and satisfactory returns for time and money invested, than a well selected, well trained, and well fed orchard. There are hundreds of them, from Canada to the Gulf of Mexico, from the Atlantic to the Pacific Oceans, that have been, and continue to bring in to their owners, princely incomes. There is no other business started with a small amount of money that grows so rapidly. No other business, while paying large dividends, lays by a sinking fund so rapidly.

The lowest estimate on horticultural value is one dollar per tree, per year, for the first thirty years. That means one acre of land planted with thirty-five trees would be worth, at that time, the large sum of \$1,050.00. Will it pay interest on this?

At this age, a minimum crop would be ten bushel. In favorable seasons, and with good attention, it will treble this. At ten bushel per tree means only 350 bushel per acre. At 50 cents per bushel (price of common apples), means \$175.00 per acre, or over 16½ per cent. interest on horticultural value. Many orchards pay for themselves and pay these dividends before attaining the age of ten years. Time will not permit of going into details on the profits of commercial orcharding. If there are any "Doubting Thomases," I can give them the names of scores of successful growers to corroborate my statements.

I will give data, secured in Orleans county, N. Y., showing yield and income from orchards sprayed different numbers of times:

How Treated.	Yields.				Income.
	No. of orchards.	No. of acres.	Average yield per acre, in Bu.	Portion of crop barrelled. Per cent.	Average income per acre.
Unsprayed,	43	381	323	66	\$103 00
Sprayed once,	33	353	345	74	139 00
Sprayed twice,	79	701	374	78	143 00
Sprayed three times,	27	247	414	87	184 00
Sprayed four times,	6	43	509	77	211 00

The orchards above mentioned were, of course, otherwise well cared for. Such instances can be given in nearly every state.

MR. SEAVY: Mr. Chairman, I would like to ask what is the cause of the bark of young apple trees four or five inches through, split-

ting. The bark splits clear to the ground on the trees, splits almost straight down in April.

DR. FUNK: You find it just with certain varieties, do you not? The Hubbardston and Nonesuch will do it to a limited extent. We find it in certain trees that are not adapted to certain localities. In the selection of varieties they must be chosen with regard to the particular locality.

QUESTION: Will Stayman's Winesap do as well, and be of as high quality in southwestern Pennsylvania, on a soil of a sandy clay formation, as in your own locality? Do you know of the Banana apple being fruited in southern Pennsylvania? If so, what is your opinion of it?

DR. FUNK: Stayman's Winesap, you must understand originated in Kansas. It is an apple peculiarly adapted to the north; no matter how far north it has been tried, it has been a success. We have certain kinds of fruits which are adapted to all soils and climates, and we should not hesitate to recommend Stayman's Winesap to any man in any locality where apples will grow. It is hearty, a heavy bearer, and of the highest quality, and if you will fertilize well, getting plenty of phosphoric acid in your soil, you will get the color.

I know nothing of the Banana apple being raised in Pennsylvania. In York state it is raised and considered a very good apple.

MR. MORRIS P. HALLOWELL: When is the best time to prune an apple orchard? Does it hurt to prune after sap starts? What will it cost to spray 10-year old trees?

DR. FUNK: You can prune the apple orchard at anytime during the year. If you are pruning for wood growth, you can commence in the fall and prune anytime during the winter and up to late spring. If you are pruning for fruit, it is best to prune in June. You understand that a fruit bud and a leaf bud are to a certain extent interchangeable; you can convert a fruit bud into a leaf bud and can convert a leaf bud into a fruit bud just by your method of pruning.

A Member: You can change a leaf bud into a fruit bud if you take it early in the spring.

DR. FUNK: Certainly you can. You may have a leaf bud developing and if you stimulate that soil by giving it a good nitrogenous fertilizer, and you cut that limb off immediately above the leaf bud and you develop a fruit bud from that. On the other hand if you have a leaf bud and your tree is not coming into fruiting, if you will tie a band around there, you will convert that into a fruit bud. You can control a tree just as you want it by pruning and by attending to it properly at the right time.

MR. T. L. WALL: Is it possible to treat San José Scale at this time or in June, if so, how?

DR. FUNK: Certainly it is; but the best time to treat it is while the tree is dormant, and lime, sulphur and salt is the best remedy.

If the trees have been inoculated and you find about the 15th of June, or perhaps a little bit later, that they need attention, then you can use some emulsion; use the kerosene emulsion, or use the soaps. Wherever you use the oil, use it in emulsified form with soap and water.

QUESTION: What variety of peaches would you set in north-western Pennsylvania?

DR. FUNK: Set varieties of the North China type, the hardiest of all the type of peaches that we have. If you take the Persian type or the Honey type, you will find they are not hardy enough, but by taking the North China type, you can commence early or take the Carman, that will withstand a temperature running down to at least twenty degrees below zero without injury, and it is an enormous bearer of fine, large select fruit. Plant with them for about your earliest. There are still earlier ones, but they cannot be depended upon. You can follow that with the Highland, and that can be followed by the Champion; then comes the Belle of Georgia. You can follow that by the Captain Eads. Those are peaches that are all extremely hardy. They are all heavy bearers and of excellent quality. The first one I gave you is a Summer Queen, one of the very first early peaches here, and coming in so early that it is wanted by every one, and it will bring big prices.

MR. CLARK: Mr. Chairman, I would like to inquire of the Doctor what his opinion is of the Elberta?

DR. FUNK: We raise them, but if you once plant Captain Eads, you will never plant another Elberta. The Elberta is large, it is beautiful in appearance, but its quality is not first-class. When you come to the Captain Eads, it is more uniform in size, and you will find it will produce an enormous crop of uniform peaches, so that you may pick a hundred baskets and you can hardly make a selection, which one is the nicest. It is a better quality than the Elberta, and whenever I have sold the Captain Eads to anybody, they always want the Captain Eads again as a yellow peach.

MR. CAMPBELL: Would it be safe to plant largely of York Imperial and Stayman's Winesap in northern Pennsylvania at an altitude of 1,200 feet, clay loam soil?

DR. FUNK: I would risk any quantity if it was on well drained land, or I could well drain it. I would risk either one of them on a sloping hillside.

QUESTION: Would you top-graft Ben Davis what are bearing with some other apple?

DR. FUNK: Yes, and you will have God's blessing upon you if you do.

MR. MILLER: How do you thin on a large apple tree?

DR. FUNK: Now that is something that you very seldom need to do, if you have started the orchard yourself and have got it into the annual bearing habit. Our young apple trees we always thin them until we get them established in regular bearing.

QUESTION: Can the King apple be grown in any soil and climate?

DR. FUNK: If you live below latitude 41 I would advise you not to touch a King apple; they are not adapted to the climate below that latitude.

MR. GLOVER: Is it advisable to sow alfalfa in an orchard of ten years' growth?

DR. FUNK: I would rather sow any other leguminous crop, as for instance, take crimson clover, or take any clover, I would prefer it to alfalfa in such an orchard.

MR. KILLAM: In what portion of this State is the San José Scale the worst? We have none in Pike and Wayne counties.

DR. FUNK: Well, if its worse any other place than it is down in our section of the country, I don't know—it is certainly pretty bad.

MR. MILLER: Does it exist in all counties? I understand that it has not been found in Somerset county yet.

DR. FUNK: I think if a proper examination was made, you will find that county is not exempt.

QUESTION: What are the best varieties of peach trees which will bear the most severe cold?

DR. FUNK: I have already answered that question.

QUESTION: Is it not too late to grow a crop of cow peas in an orchard after potatoes are out?

DR. FUNK: No, I am going to sow if the weather is fit, next week, using the Whippoorwill variety. You can take the Black Eye and some of those varieties that mature quickly and it is all right.

QUESTION: What varieties of pears would you advise for Clearfield county?

DR. FUNK: If you know how to raise them, I would say the Keiffer pear, then pick it at the right time and it is as smooth as any Bartlett pear you ever ate. It is of excellent quality and will bring prices equal to any Bartlett pear. Of course if you want it for home use, you want it for a selection, and you will get nothing better in quality for that purpose than the Seckle pear. The Bartlett Seckle is another pear that can be recommended, and the Duc D'Anjou is another pear that is all right. I maintain that all fruits are annual bearers when properly attended to.

QUESTION: What is the trouble with the cherry trees? For the last two or three years they are all dying off?

DR. FUNK: That is only the sweet varieties, is it not? You take the common wild cherries and the sour cherries and we can do well enough with them in our section of the country, but we can't do anything with the sweet variety, and the only plan is to

keep the trunk shaded from the afternoon sun; in that way you can avoid the splitting of the bark, otherwise you cannot do it.

MR. SEEDS: Doctor I have got seventy-five grape-vines around my wire fences. Now how would it be to gather the stones on that orchard and mulch every other grape-vine? I have got a stone pile on every other grape-vine.

DR. FUNK: I would prefer to mulch with alfalfa or clover or anything of that kind.

MR. SEEDS: I can't cultivate it, it is pretty steep, you know. It's pretty hard to keep the stones from rolling off the farm.

DR. FUNK: How do you do with your grapes, squeeze the juice out and let it run down hill?

MR. WATTS: Mr. Chairman, I would like to ask the Doctor a question. Would like to know whether in a commercial orchard, for instance, you would plant Stayman's Winesap or the York Imperial or the Spy in blocks of four or five hundred and will they do well if planted in that way?

DR. FUNK: There is no variety but what is improved by cross pollenization. Take nine-tenths of the varieties of apples that we have at the present time, and they are practically self-serving. You can take many of them and you put one single scion—you may take an apple tree that is a fair bearer and do that, and you will make it a heavy bearer because it is so strong in the pollenizing power; cross-pollenization is an important factor.

MR. WATTS: I have quite a good many Baldwin trees and they scarcely fruit at all, and I have attributed it to that fact.

DR. FUNK: There is an orchard where I think there are seventy-five acres of Baldwin apples; that orchard was unprofitable, hardly ever bore until they took about every third row and topped that with the Rhode Island Greening, and after that it was one of the most productive orchards in that part of the State, showing the benefits of cross-pollenization.

The Chairman announced the Committee on Resolutions as follows:

SAMUEL McCREARY, Chairman,
FRANKLIN MENGES, Secretary,
T. E. ORR,
MATTHEW RODGERS,
AMOS B. LEHMAN,
D. A. KNUPPENBURG,
M. N. CLARK.

MR. HERR: Mr. Chairman, I move that we do now adjourn. The motion having been duly seconded and the question put, it was agreed to, and the meeting adjourned to 7.30 o'clock this evening.

Court House, Clearfield, Pa.,
Tuesday Evening, 7.30, May 29, 1906.

The meeting was called to order at the designated hour by Hon. Jason Sexton, of North Wales, Pa., Chairman for the evening session.

The CHAIR: It gives me great pleasure to introduce to you Prof. J. W. T. Duvel, of the United States Department of Agriculture, Washington, D. C., who will now address you on "Good Seed, and How to Obtain It: Adulterated Seed."

Prof. Duvel delivered the following address:

GOOD SEED AND HOW TO OBTAIN IT.

By PROF. J. W. T. DUVEL, *United States Dept. of Agriculture, Washington, D. C.*

The question of the quality of the commercial seeds of our farm crops, particularly of our forage plants, is one of the most important with which our farmers have to contend to-day. During the last decade the quality of agricultural seeds which have been placed on the market has grown gradually worse, and within the past six months hundreds of thousands of pounds of worthless trash, screenings or misbranded seed has been sold to our farmers and much of it at fancy prices. The low quality of seed is particularly marked in red clover, alfalfa, orchard grass and Kentucky bluegrass. But inasmuch as the farmers of Pennsylvania are but little interested in orchard grass or Kentucky bluegrass, I will discuss principally the quality of commercial red clover and alfalfa seed.

Every man who practices general farming knows that to omit red clover or a closely related leguminous plant from his rotation, almost invariably leads to a failure of crops. Yet, go into any section of the country you please and farmers will tell you that they can no longer grow red clover successfully in their fields. They say their land is "clover-sick," needs lime or some other treatment, they know not what. If the soil is known to be all right, the failures are attributed to unfavorable weather at the time of sowing or perhaps to a drouth later in the season. Undoubtedly any one of the foregoing factors may result in the failure to get a stand of clover, but an inspection of the quality of the seed which is being sold will show that scores of failures can be traced directly to low grade seed. In fact, to one who has examined the quality of commercial seed, it is surprising to know that the failures are not much greater than now reported. Seed of low vitality will not produce plants which will thrive even under favorable conditions. While if the seed is of strong vitality, the young plants will be healthy and full of vigor; capable of producing good plants, unless the conditions are extremely unfavorable. It is safe to say that good seed will almost invariably give a good stand when sown in sections adapted to the production of red clover.

Similarly we find innumerable failures in the growing of alfalfa, the crop which promises to be of inestimable value to our farmers.

Alfalfa has been so highly recommended, and the difficulties of securing a stand so strongly emphasized that most farmers have come to think that a stand of alfalfa can be secured only after one or more failures. If every farmer could know what percentage of the seed sown is pure alfalfa, and what percentage of the pure seed is capable of germinating and producing vigorous plants, then the many reported failures would be viewed in an entirely different light.

For a number of years the United States Department of Agriculture and many of the State Agricultural Experiment Stations have been endeavoring to point out to the farmers of the United States what enormous quantities of low grade clover and alfalfa seed are sold in the market. These efforts have resulted in a marked degree of success, but considering that the quality of red clover and alfalfa seed is poorer to-day than it has ever been before only shows that the American farmers have not made the most of their opportunities in securing a good grade of seed. In order to bring this clearly before you I beg to make use of some charts which show the result of the analyses of a few samples of commercial seed. The first that is to be considered treats of red clover.

Chart I.—Analyses of representative samples of commercial red clover seed which were obtained in the open market.

	1	2	3	4	5	6	7
Broken seed, dirt, etc., per cent.,	4.5	1.2	2.8	3.5	3.4	10.7	11.5
*Seeds not red clover, per cent., .....	.3	.8	4.2	2.6	3.6	12.2	24.3
Number of kinds of weed seeds,		15	5	13	19	40	26
Number of weed seeds per pound,		3,253	2,657	3,719	21,156	38,334	73,785
Pure red clover, per cent.,	25.2	98	93	93.9	93	77.1	64.2
Germination, per cent.,	93	94.5	91	89.5	80	68	71.5
Price paid per bushel,	\$8.75	\$8.50	\$8.00	\$8.00	\$7.50	\$7.50	\$6.00
Actual cost per bushel of pure seed which would grow,	9.88	9.18	9.45	10.58	9.06	14.24	13.07

*This may include alsike clover, white clover, timothy or some of the other valuable forage plants, which are not included with the weeds.

Broken Seed, Dirt, Etc.—In all commercial seed there is more or less broken seed, stems, dirt, chaff, etc. However in a well-cleaned lot of seed the amount of inert matter of this character need not be large, at least not more than two per cent. The seven lots of seed here represented show from 1.2 per cent. to 11.5 per cent. of inert matter. Samples 6 and 7 contain a high percentage of broken seed and dirt, representing a direct loss of 10 or 12 per cent., which will likewise result in a reduction of the amount of seed sown per acre.

In addition to the presence of broken seed, parts of stems, etc., crushed quartz is not uncommonly found in commercial seeds. These small particles of rock are screened so as to be approximately of the same size and in some instances are stained to be of the same color as the seed with which they are to be mixed. A few years ago there existed in both Europe and America, firms whose business it was to supply unscrupulous dealers with such crushed quartz sand at a cost ranging from \$1 to \$3 per one hundred pounds. This was then mixed with red clover and ultimately sold as such to our farmers.

It is, however, gratifying to know that this illegitimate practice is at present much less common than it was a few years ago.

Foreign Seeds, Weeds.—Aside from the presence of a considerable quantity of broken seed and dirt, the majority of commercial samples contain a large number of seeds other than red clover. In many instances these are seeds of many of our most noxious weeds.

Every institute worker present this evening, however, knows only too well what the presence of bad weeds mean on the farm. Every farmer in the United States, at least every good farmer, realizes that many dollars could be added to his bank account every year were it not for the weeds. They rob the soil of the nourishment which is needed for bringing our crops to the highest state of maturity and productiveness. They crowd out the young and tender plants which cannot survive without the requisite amount of light and air. Likewise, the amount of time spent with the scythe or hoe, cutting thistles, burdocks, cockleburrs, plantains, dandelions, wild carrots, wild parsnip and scores of others, is a bugbear to successful farming and particularly to the farmer's boys.

Some of you no doubt want to ask where the weeds all come from. This can be best explained by means of the results of the analyses as shown in Chart I. Sample Number 1 contains no weed seeds, the seed has been well cleaned and is of extremely good quality in this respect. Sample Number 2 contains fifteen different kinds of weed seeds, aggregating 3,253 in every pound of red clover seed. Seeding at the rate of 12 pounds per acre, means that the farmer himself has bought from his seedsman and sown on each acre 39,036 weed seeds, representing fifteen different kinds. This rate of seeding is nearly four times as great as the number of corn stalks on an acre, allowing three stalks for every hill of three and one-half feet. Samples 3 and 4 contain approximately the same number of weed seeds as sample Number 2, yet the number of weed seeds in either of these three samples is relatively small when compared with the average quality of commercial red clover seed. Sample Number 5 contains nineteen different kinds of weed seeds, aggregating 21,156 seeds in every pound of red clover seed. These were made up of buckhorn, broad plantain, barbed plantain, wild carrot, sorrel, curled dock, lamb's-quarters, pigweed, spurge, catchfly, chickweed, pennyroyal, five finger, foxtail, three kinds of panic grass and two kinds of quack grass. In addition to these there was present timothy, Kentucky bluegrass, white and alsike clover which of course, are not considered as weeds. This sample was offered by a western seed-house as "Strictly Prime Seed."

Sample Number 6 contains forty different kinds of weed seeds and Number 7 contains twenty-six different kinds, the former having 38,334 and the latter 73,705 weed seeds in each pound of red clover seed. Every twelve pounds of seed (an average amount sown per acre) from lot Number 6 contains 460,008 weed seeds, while twelve pounds from lot Number 7 contains 885,180 weed seeds. The former will give 10 weed seeds and the latter 20 weed seeds on each and every square foot of soil.

I think with this there is no longer any question as to where our weeds come from. When they once get into the soil their eradication is a very difficult task. Our seedsmen, you know, are generous and I presume give these as premiums with agricultural seeds,

the same as many of them give the small packages of mixed flower seeds with every purchase amounting to \$1 or more.

It is not uncommon to find commercial red clover seed which contains a relatively high percentage of timothy. In such cases the dealer generally succeeds in convincing the farmer that the presence of timothy seed will improve the quality of the pasture and the hay. This may or may not be true, but whenever you find such seed on the market you can rest assured that the dealer is selling you timothy seed at clover seed price? If you wish to sow a mixture of clover and timothy, buy the desired quantity of timothy seed, the best of which should be bought for two or three cents per pound and do your own mixing, thereby saving ten or twelve cents per pound on all the timothy seed sown. The presence of more than a trace of timothy seed means one of two things—either the mixing has been done intentionally in order to increase the profits, or the seed has not been cleaned and is probably a fair indication that innumerable weed seeds are present.

Pure Red Clover Seed.—By pure seed is meant the amount of whole seed of the kind examined whether it be immature and shriveled, discolored or good plump seed. The only matter excluded being the broken seed, dirt, stones, sticks, chaff, etc., and all seeds not of the kind examined. Sample Number 2 in Chart I, shows 98 per cent. of pure seed, and there is no reason why a good grade of red clover seed should be less than this. Sample Number 1, however, while not so high in either purity or germination, is given first place owing to the absence of weed seeds. The .3 per cent. of foreign seed as indicated in sample Number 1 consists of alsike clover and a few timothy seeds, which are not objectionable when present in such small quantities.

The amount of pure seed contained in samples Numbers 6 and 7 is only 77.1 and 64.2 per cent., respectively. Such samples as these are considered as very low-grade seed, yet thousands of pounds of seed of this character are being sold every year, and many lots of even lower grades.

Germination.—There is probably no factor in crop production of more importance than the vitality of the seed sown. At the same time it is equally true that there is no factor more frequently overlooked. If the seed is not of good strong vitality the resulting crop is certain to be a failure. Look, if you please at samples Number 6 and 7 in Chart I; the former germinated 68 per cent. and the latter 71.5 per cent. With the low percentage of purity and germination the actual value of the former is 52.4 per cent. and of the latter 45.9 per cent. (the percentage of purity multiplied by the percentage of germination). Either of these would result in a failure to get a stand, even under favorable conditions. Sample Number 3 which has a purity of 93.9 per cent. germination only 80.5 per cent., meaning an actual value of only 75.6 per cent.; i. e., when seeding at the rate of twelve pounds per acre, only nine pounds of germinable seed would be applied. As an extreme case compare sample number 3 in Chart III which shows 218 per cent. of pure seed which germinated 81.5 per cent., giving the sample an actual value of 17.8 per cent. And still more extreme is the sample of alfalfa shown in Chart III, column 6 which contained 23.5 per cent. of pure seed

and germinated only 27 per cent., having thus an actual value of 6.3 per cent.

Cost of Seed.—The cost of the seed is, or should be, only of secondary importance. The first consideration should be the quality of the seed itself. Presumably the cost of the seed is regulated according to the quality, but this is not necessarily true. If the dealer is known to be thoroughly reliable, a fairly safe rule to follow is to buy what he calls his best grade. This is, however, not always a safe guide.

In the charts given herewith is shown the price paid per bushel for the different lots of seed and likewise the actual cost per bushel of the pure seed which will grow. It is the latter factor which determines the value of the different grades of seed. This, however, does not take into consideration the number and kinds of weed seeds present, which should always be reckoned with. Samples Numbers 3 and 4 were each sold at \$8 per bushel. The percentage of pure seed was slightly higher in Number 4 than in Number 3, but the germination of the former was approximately 10 per cent. lower than the latter, making the actual cost of Number 3 \$9.45 per bushel and of Number 4 \$10.58 per bushel. Moreover, sample Number 3 contained less weed seeds, both in number of kinds and number of seeds and is therefore much the best grade to buy. The same is practically true of Numbers 5 and 6—seed sold at \$7.50 per bushel. It will be observed that the actual cost of Number 5 is less than any shown in Chart I, but owing to the large number of weed seeds such seed should not be purchased.

ADULTERATED SEED.

The adulteration of seed is not uncommon in the trade, and it is quite necessary that the farmers should learn to what extent this adulteration is being carried on. Of recent years unscrupulous dealers have placed large quantities of seed on the market which has been mixed with other seeds very similar in appearance but much less valuable. Red clover and alfalfa, particularly alfalfa, lend themselves very readily to the adulteration with yellow trefoil or black medick (*Medicago lupulina*). This is grown in Europe to a limited extent where it is used principally as a sheep pasture. It is found growing as a feed in many sections of the United States. Its use, however, as a forage plant, where alfalfa or clover can be grown is not worthy of consideration. Large quantities of this seed are imported into the United States at a cost of about five cents per pound, and when mixed with alfalfa command a price of from fifteen to twenty cents per pound. In addition to the use of trefoil as an adulterant for alfalfa, two species of bur clover (*Medicago denticulata* and *Medicago arabica*), and occasionally sweet clover (*Melilotus spp.*) are sometimes used illegitimately in this way. Alfalfa is seldom adulterated more than 50 per cent., but a few cases have come to our notice where the pure trefoil has been sold as high-grade alfalfa. The extent to which this mixing is done is shown in the tabulated results given in Chart II.

Chart II.—Analyses of samples of seed sold as alfalfa. Adulterated seed.

	1	2	3
Broken seed, dirt, etc., per cent.,	13.4	15.4	4.4
Seeds not alfalfa,	12.5	19.3	46.1
Adulterants, per cent.,	10	16.5	45.7
Pure alfalfa seed, per cent.,	74.1	65.3	49.5
Germination, per cent.,	50	43.5	95
Price paid per bushel,	\$12 00	\$6 01	\$9 60
Actual cost per bushel of pure seed which would grow,	\$2 40	21 12	20 48

The three samples in the table show an adulteration of 10 per cent., 16.5 per cent. and 45.7 per cent. respectively. In addition to the adulterants lots 1 and 2 contain a relatively high percentage of broken seed, dirt, etc. Moreover, the germination of the pure alfalfa seed contained in these two samples is so low (50 per cent. and 43.5 per cent.) as to render them almost worthless. The high percentage of dirt and the low vitality of the alfalfa seed is made possible owing to the nature of the adulterant. The trefoil seed is of a slightly brighter green color and when mixed with low grade alfalfa gives the seed a good appearance. When mixed with good clean alfalfa seed, the mixture would be considered as an exceptionally fine grade of alfalfa seed to one not able to distinguish the two kinds.

The first sample was sold at \$12 per bushel, twenty cents per pound, which should buy the very best seed on the market. The actual cost of the alfalfa seed which would grow contained in this lot of seed was \$32.40 per bushel. The actual value of the sample was 37.2 per cent.—which could possibly result in nothing other than a failure to secure a stand. This is likewise true of the other two lots of seed.

Kentucky bluegrass and orchard grass are also very commonly adulterated. The Kentucky bluegrass is adulterated with Canada bluegrass for which purpose approximately 700,000 pounds are imported annually into the United States from Canada at a cost of about one-half that of Kentucky bluegrass. The difficulty to distinguish the seed of these two grasses is very great and large amounts are sold as Kentucky bluegrass which contain no Kentucky bluegrass at all.

Orchard grass is largely adulterated with meadow-fescue and English rye grass. Of 265 samples of orchard grass obtained in the open market last year, 133 were found to be adulterated, the degree of adulteration varying from 1.1 per cent. to 98.55 per cent.

Further information relative to the adulteration of seeds can be had by consulting circulars numbers 12, 14, 15 and 18, published from the office of the Secretary, U. S. Department of Agriculture. These circulars give the names and addresses of seed firms who sold adulterated red clover, alfalfa, Kentucky bluegrass and orchard grass seed during the past eighteen months.

IMPORTED SEED.

Aside from the importation of large quantities of trefoil and Canada bluegrass which are used principally as adulterants, hun-

dreds of thousands of pounds of low grade alfalfa and red clover seed are brought into the United States every year from Europe. It must not be understood that all of the red clover and alfalfa seed imported into the United States is of poor quality for much of it is high grade seed. The importation of the low grade seed, however, should be discontinued and this can be best accomplished by our farmers refusing to buy seed of this kind. The tabulated results of a few importations of alfalfa and red clover are here given in Chart III:

Chart III.—Analyses of samples of imported red clover and alfalfa seed.

	Red Clover.			Alfalfa.		
	1	2	3	4	5	6
Amount of importations, pounds,	30,550	6,740	9,800	88,185	12,106	12,540
Total value,	\$3.156	\$349	\$570	\$9.650	\$.80	.....
Pure seed, per cent.,	95.5	48	21.8	97.5	96.2	23.5
Germination, per cent.,	92	35.5	81.5	89	28	27
Number of weed seeds per pound,	4,627	139,727	.....	454	816	17,190
Price paid per bushel,	\$6 18	\$3 10	\$3 68	\$6 54	\$4 86	*
Actual cost per bushel of the good seed which would grow,	7 04	18 17	20 70	7 53	18 05	16.3

*Actual value of the sample based on purity and germination.

†Per cent.

The chart shows one consignment of red clover consisting of 30,550 pounds, which was of fair quality, but the other two consignments which aggregate 16,040 pounds, were both of very poor quality. The actual value of Number 2 being 17.04 per cent. and that of Number 3 being 17.8 per cent. The conditions with the alfalfa are even worse. The actual value of the consignment of seed shown in column 6 was only 6.3 per cent. This same seed also contained 17,190 weed seeds for every pound, 4,754 of which were seeds of the clover dodder, the most dangerous weed for the clover and alfalfa field.

One consignment of 48,600 pounds of particularly low grade alfalfa seed was received at New York little more than one year ago which was imported for one cent per pound (sixty cents per bushel). This lot consisted of immature, brown dead seed—all of which was undoubtedly used for grading down good seed, as is all of the low grade seed which is imported. Some dealers frequently contend that consignments of seed of this character are re-cleaned, and that only the good seed gets into the market, the screenings being discarded. The most superficial examination, however, will show that this is far from the truth. The good re-cleaned seed in consignments, Numbers 2 and 3 of the chart cost \$18.17 and \$20.70 per bushel respectively. Would any sane man import clover seed at those prices, when as is shown in column 1 of the same chart he could have obtained a good grade of seed for \$7.04 per bushel?

HOW TO AVOID POOR SEED.

I am convinced that those of you who have followed what has been said, are almost of the opinion that the American seed trade

is deserving of but little respect. In view of this I desire to say, and with considerable emphasis, that our American farmers get from the seedsmen about the quality of the seed they deserve. The demand everywhere is cheap seed and it is about time that our farmers were beginning to wake up on the seed proposition and instead of demanding cheap seeds, to demand good seed of high purity, strong vitality and free from noxious weeds.

If you desire seed of good quality, secure samples from your seedsmen and send them to your Agricultural Experiment Station and have them examined. But first of all avoid the cheap grades for cheap seed necessarily means seed of low vitality, a large percentage of screenings, innumerable weed seeds, and the officials of your Experiment Station cannot afford to examine samples of this kind. Demand of your seedsmen good clean seed of high vitality, and with the assistance of the Director of your Agricultural Experiment Station, you will get it.

SEED LEGISLAION.

Unless our farmers soon begin to realize the importance of sowing only high grade seed, the time is not far distant when some legislation will be necessary to prevent the sale of adulterated and low grade seed. Europe has had Seed Control for a number of years and the dealers must guarantee purity and germination. It is this European Seed Control which is largely responsible for the heavy importations of screenings and low grade seed into the United States. Similarly the recent enactment of a very rigid seed law in Canada has had a like effect. Our choice seed is exported to Canada and to Europe and the screenings from this choice seed are retained for our own sowings. Moreover, the screenings from the Canadian and European seeds are sent into the United States because they cannot use them at home, while they find a ready market for them here. It is to be hoped that our farmers will take this matter into their own hands and avoid legislation by persistently demanding a high grade seed. However, if legislation regulating the sale of agricultural seeds is undertaken it must of necessity be severe in order to be effective. Some of our states already have seed laws in which it is necessary to prove the intention of fraud, which is almost wholly impossible. The only effective seed laws must be such that any dealer selling or offering for sale seed of a quality other than that which is permissible under the law shall be subject to a fine or imprisonment or both. There is no reason why the seedsmen should not know within certain bounds the quality of the goods he offers for sale just as much as the man who sells fertilizers.

A Member: If I should send you a sample for examination how soon would you send it back?

PROF. DUVEL: We try in our work at Washington to accommodate the farmer. If you tell us that you are in a particular hurry for it, we examine it and send out the answer by telegraph at your expense, of course. For a detailed examination it would take on an average sample—it might take three or four hours to work it out. Sometimes samples have to say in our laboratory a week before we can get to them.

MR. DAVIS: I know of samples that were sent to our experiment station at State College, and we didn't get an answer for six months.

PROF. DUVEL: I know that your facilities are limited at State College.

MR. CRAWFORD: I have got prices on goods now. Can you tell me which is the best? Is there any way to determine that?

PROF. DUVEL: So far as the trade names are concerned, they mean absolutely nothing, but there is quite a difference in the prices; it is a way they have of grading them. But to say they tell absolutely nothing, it is probably putting it a little too strong. Personally I think a seedsman that is in the business, if he makes up his mind that he is going to sell only a good quality of seeds, sell only the very best, he is going to build up his trade.

PROF. BUTZ: Mr. Chairman, I would like to say that I do not know of any sample of seed that has been lying at State College for six months, and they all would have to come to me if they had come there for a test. I want to say that arrangements have been made for tests whenever asked for. A germination test requires about ten days in order to complete the test, but if it is specified that they simply want to know the quality of the seed it will take but a very short time. I would like to know from Brother Davis where that seed was sent from; perhaps he would prefer to tell me privately.

MR. DAVIS: Mr. Chairman, I would say to Dr. Butz that maybe I am mistaken, but as I understood it, the man sent up a sample, and then wrote again and got a reply, and it took some six months.

MR. HOWDEN: Mr. Chairman, I would like to ask the Professor if the farmer couldn't do some of this work himself.

PROF. DUVEL: Yes, certainly he could. I took a quantity of these seeds, twenty-five in each lot, I counted that many out very readily and in about ten days one of the lots germinated strong; the leaves looked dark and healthy, while the others would hardly germinate; the lowest priced seed was the one that did not germinate. I very readily tested them and I took the other seed at half a dollar higher. Now you can determine with a strong microscope just how they appear.

The farmer can test them for weed seeds very well; he has to have a little magnifying glass. The way we do to make an examination, we take ordinarily about five grammes, that makes probably a teaspoonful or something like that. We then take a number of checks that these represent, showing the quality of the samples, and we simply put them down on a piece of white paper and go at them with a pair of forceps, and then these three different parts are weighed. A farmer can do that himself, or any man can do that and get a very good idea. Separate those which had the good clover seed and get those out by themselves, and then the weed seeds, and get the two piles together and estimate the amounts. Of course it is quite an important factor in that case to know these

different kinds of weeds. They may be common fox-tail or fall grass. I got a sample last winter that contained over fifty per cent. of fox-tail, and fall grass that was brought to me as good quality of seed. The farmer who grew it of course thought it was good.

As for the germination test, the farmer can do that just as well as we can do it at the experiment station and it is just as satisfactory. It does not take any very special apparatus, either. Take simply two dinner plates and a strip of cotton flannel about that long (indicating) and moisten that cotton flannel thoroughly and squeeze it out so that it does not drip and put down two thicknesses of it at the bottom of the plate and upon that we put our seed. Now there is one thing which I would mention as a precaution; never make a germination test without knowing exactly how many seeds you put in. If you do, you don't know in such a case whether ten per cent. germinate, or whether you have ninety-nine per cent.

A Member: If I find that by examination under the magnifying glass, would it be absolutely necessary for me to know the botanical names of these weeds?

PROF. DUVEL: No, it would not; you would take it for granted that they were bad seeds anyhow.

The CHAIR: The next subject on the program is, "Domestic Science, or Farm Homes," which was to have been presented to us by Mrs. T. E. Orr, of Beaver, Pa., but on account of her illness we shall be obliged to dispense with that topic, and we will pass on to the next number on the program, No. 3, which is entitled "Accumulation of Soil Nitrogen." We shall have the pleasure of listening to Prof. J. W. Harshberger of the University of Pennsylvania who will now address us upon that topic. It gives me pleasure to introduce to you Prof. Harshberger.

PROF. HARSHBERGER: Mr. Chairman, and Ladies and Gentlemen: I have been asked to speak on the accumulation of soil nitrogen. Before speaking on that subject, I would like to say a few words about how the nitrogen is lost from the soil. Perhaps the most important way is the drainage from the upper layers of the soil down into the lower layers, down into the sub-soil. Now this takes place more rapidly in autumn and in the winter months. The nitrogen is lost and the other ingredients are lost more or less rapidly during the summer and winter months.

Now it is very important to grow a catch crop, some crop that will hold that soil nitrogen.

Prof. Harshberger then read the following paper:

THE ACCUMULATION OF SOIL NITROGEN.

By PROF. J. W. HARSHBERGER. *University of Pennsylvania, Philadelphia.*

It is important before considering the accumulation of soil nitrogen, to briefly state how the soil may lose this valuable chemical substance. The nitrogen in the form of ammonia gas may be diffused

into the atmosphere, and there is no doubt, but that a very considerable amount of nitrogen is thus dissipated. The soluble nitrites and nitrates may be removed from the surface layers of the soil by drainage into the subsoil, where they usually find their way by the percolation of rain water from above. This loss by drainage is greatest during the late summer and autumn, when the process of nitrification is excessive, and hence, it is important to grow some crop which will catch this nitrogen. Here, we have the explanation why Indian corn does not exhaust the soil, as rapidly, as some other crops. The growth of corn extending much further into the late summer and autumn, the plant is adapted to utilize the nitrates formed by the active processes of nitrification. In the third place, under certain conditions of soil, the nitrogen may be united chemically so as to form insoluble compounds, and thus, the available nitrogen is locked up in some unavailable form, or by the process of denitrification, the nitrogen may be set free upon the decay of dead plants and animals that are found in any given soil, and thus lost to the growing crop. Perhaps, the largest amount of nitrogen is removed from the soil in the harvesting and disposal of growing crops. These crops are in general sold at our large centers of population, or are exported to foreign countries, where, they are lost, in the form of manurial wealth to the country in which they are produced. In the husbanding of our natural resources, the sewage from our large cities, which is poured into the rivers and ultimately finds its way to the sea should be pumped into reservoirs where, by a proper system of distribution, it can be delivered to the fields, where it is most needed. Connected with this sewage disposal is the encouragement of home industries and local markets, where the produce of our farms might be utilized directly without the expensive outlay necessary to export such products to foreign lands.

Having briefly outlined the ways in which the soil becomes impoverished, it is important clearly to state how the nitrogen of the soil may be accumulated. One of the most important sources of supply is barnyard manure, which contains large quantities of ammonia, but that ammonia cannot be absorbed directly by the root hairs of the plant. We have abundant experimental proof that green plants, except the leguminosae, can utilize the nitrogen only in the form of nitrates, or only to a very slight extent, as ammoniates. The ammonia in the manure must be converted into the higher form. It has been found that there are two steps in this conversion through the activity of soil bacteria. One kind of bacterium converts the ammonia into nitrous acid, or nitrites, the other organism transforms the nitrous acid (nitrites) into nitric acid, or the salts of nitric acid, the nitrates. The growth of these organisms in the soil is stimulated by aeration, by the requisite moisture and by a feebly alkaline condition of the soil. Too much organic material, too much water and too acid a condition of the soil, inhibits the growth of the micro-organisms concerned in nitrification. Once the ammonia is converted into nitrates, the supplies of nitrogen in the soil become available to green plants. The root hairs of all our crops take up the nitrates in the soluble form, and in the green parts, they are converted into protoplasm, or by protoplasmic activity stored as nitrogenous reserve food. Many plants are inde-

pendent of this supply of nitrogen, viz: the leguminosae, and can utilize directly free atmospheric nitrogen.

We have, therefore, two classes of agricultural plants: Nitrogen Consuming Plants and Nitrogen Storing Plants. The nitrogen consuming plants can utilize the nitrogen only in one form and that is as nitrates. There are four groups of these nitrogen consuming plants, viz: root crops, which include the potato, sweet potato, radish, turnip, beet, mangold wurzel, horse radish and onion; leaf crops, viz: kale, celery, lettuce, cabbage, salad plants in general; fruit crops which comprise apples, pears, quinces, strawberries, cherries, peaches, etc., and lastly the cereals, such as wheat, rye, barley, oat, millet, maize and various other grasses grown for hay. All of these enumerated crops need nitrogenous supplies for their best development, because sugar, starch and other carbohydrates reserve materials are only stored in the plant in considerable quantities when nitrogen is present in efficient supplies. The proper storage of the various carbohydrates can take place only when the storage cells are supplied with the requisite amounts of nitrogen and potash. If the plant is nitrogen hungry, such carbohydrate supplies are not usually reserved.

The second group of agricultural plants, the nitrogen storing, comprise those plants that belong to the natural order leguminosae. These plants, if the soil is rich in nitrogen, or if nodules do not form on their roots, act as ordinary nitrogen consuming plants, i. e., they require nitrogen, but in ordinary soils, the tubercle forming bacteria are in sufficient numbers to cause the production of nodular swellings on their roots. When the seeds of clover, or some other leguminous species are planted, soon after the primary roots appears with its root hairs, the nodule producing organism *Rhizobium leguminosarum*, attracted perhaps chemotactically to the fine root hairs, penetrates the wall of these root hairs by ferment action and enters through these cells into the middle cortex layers of the root. So many organisms enter at once, that they form a long slimy cord, almost hyphae like. Here in the root cortex cells, the micro-organisms form nests, or pockets, that become filled with bacteria. The presence of these rod-shaped bacteria causes the formation of swellings, tubercles or nodules on the roots of the leguminous plants. Here they remain, utilizing the free atmospheric nitrogen until about the time of flowering, when the germ cells begin to undergo involution changes, enlarging considerably in size and assuming S-shaped, or Y-shaped forms. After this, they are gradually absorbed by the green plants as protoplasmic and nitrogenous substance and this substance is conveyed to the actively growing points, or stored as nitrogenous reserve supplies. The growth of these useful organisms in the soil is stimulated by aeration, by a considerable amount of organic material, by proper soil drainage, so as to prevent the accumulation of water and liming, so as to overcome soil acidity.

When the leguminous crop is mature, or before it is mature, it may be plowed under as a green manure. Here by the process of putrefaction, the organic nitrogen of the living plant is converted into a form of nitrogen which through the agency of the nitrifying organisms is again converted into a form available to the growing green plant. Thus the nitrogen cycle is completed. Or, if the leguminous crop is consumed, it should be used on the farm and not

sold off the farm, because as barnyard manure, the plant substance can be restored to the soil, and only as much nitrogen is lost theoretically, as is removed in the animal tissues. One of the most approved methods of agricultural practice is to grow leguminous crops for home consumption and afterward nitrogen consuming crops for sale. One practical farmer grows mixed crops of leguminous plants, liberally fertilized with potash and phosphoric acid. He converts the first year's crop into silage, which he feeds to his cattle, returning the manure to his soil and converts the second year's produce into hay. The land thus produces highly nitrogenous crops without manure and is left in a high condition for potatoes, or cereal crops, which respond to dressings of nitrogenous fertilizers.

Having ascertained these facts, the question naturally arises? How can the growth of leguminous plants be encouraged? It has been discovered, that leguminous crops require considerable supplies of potash and phosphatic fertilizers. Potash has considerable to do with the metabolism concerned in the formation of carbohydrates and phosphorus compounds with the nitrogenous metabolism. The writer was impressed by this fact in 1892 on a visit to the Rothamsted Experiment Farm in England. Whenever nitrogenous fertilizers were supplied, there was a natural appearance of grasses on the plots thus treated. Whenever potash replaced the nitrogen, the grasses diminished and leguminous plants occupied the ground.

From what has preceded, it becomes necessary to study the nodule producing bacteria. Can these be added to the soil, or used so as to increase the number of root nodules per plant? This has been accomplished by the methods of pure culture. Pure cultures of the various races of *Rhizobium leguminosarum* have been grown and these have been introduced into the soil directly, or on the surface of seeds previously dipped in the liquid-culture media. The United States Department of Agriculture distributes these germs on cotton previously soaked in the liquid culture media, but this method being open to certain objection, culture tubes of pure germ growths are now being largely used.

The following precautions should be observed in using the pure cultures of the nitrifying organisms. Inoculation of the soil is desirable, if it is low in organic matter and has not previously borne leguminous crops, or if the legumes previously grown on the same land have been devoid of nodules, or if the legume to be sown belongs to a species not closely related to one previously grown on the same soil. For in order to prevent clover sickness, it is advisable to grow in succession a variety of leguminous crops. Inoculation will prove useless, if the legumes usually grown are producing average yields, or, if the roots show nodules in abundance. If the soil is rich in nitrogen, it is useless to inoculate the soil for few nodules are formed under these conditions. Inoculation will be a failure, if the directions are not carefully followed, or if the soil is acid and in need of lime. In most cases failure will result, if the soil needs fertilizers, such as potash, phosphoric acid or lime. In all cases, it should be remembered that soil inoculation will not overcome the results of bad agricultural practice.

MR. SEEDS: Mr. Chairman, I would like to ask the Professor a question. Professor, if I understand you right, I understood you

to say that of some leguminous plants, some may and some may not have nodules on.

PROF. HARSHBERGER: Yes.

MR. SEEDS: The ones without nodules on, are they any better to the farmer?

PROF. HARSHBERGER: No, the leguminous plants—it is only when the soil is deficient in nitrogen that these plants become nitrogen restorers.

QUESTION: The leguminous plant without the nodules on is no better than the others?

PROF. HARSHBERGER: No; one farmer may have a good catch of clover, and another not, and one may have the nodules on and the other not. You may get a catch of clover without the nitrogen.

QUESTION: Then there is no use of growing clover only that the man that has the nodules on the roots is ahead of the man who has nothing; if I understand you right, you say all soils have the bacterial germs more or less.

PROF. HARSHBERGER: Yes, as I understand, the soil that has been growing clover will have the red clover germ; there might be a difference in these different germs, for instance germs that will take on red clover will not take on alfalfa; it is all one germ as I understand it, but there are slight differences, so that one may accept that particular sort and grow white clover or crimson clover or alfalfa, even if the soil has only the crimson germ. Soil which contains only white clover—the nodules will not be formed on a red clover crop.

MR. SEEDS: Pennsylvania has been a great clover state and it ought to be inoculated thoroughly with the bacteria of the clover plant, but it is still getting harder to raise clover every year.

PROF. HARSHBERGER: The germs must have exhausted their vitality, as far as I know, like when a man has been working in one position for many years. You know he needs a change after a while—a summer vacation now and then. These bacteria are exactly like higher organisms in a certain way, I am inclined to think.

The DEPUTY SECRETARY: Mr. Chairman, I would like to ask the Professor, in case the potash should be exhausted in the soil, would that have any effect

PROF. HARSHBERGER: I think so, yes, sir.

MR. DRAKE: Professor, if I have a field that is rich in nitrogen, if I supply the bacteria by the patent process, will they produce nodules?

PROF. HARSHBERGER: I think if you observe the precautions that are recommended, that result will follow, in soil not water-logged, good, mellow soil containing the potash and other

matter required. If you have a soil that is already rich in nitrogen, you don't want them then.

In Germany, near Berlin—Berlin is situated in a very sandy district—the only thing they can grow is pine trees in that neighborhood. They grow the yellow lupine. After the growth of the lupine, it becomes very much richer in nitrogen.

MR. NELSON: Mr. Chairman, I would like to ask the Professor if the presence of potash in the soil is one of the principal things in the growth of clover, that when we burn and clear new land in this country, why it is that we have a condition there in which clover will not catch on, or germinate, except in rare spots.

PROF. HARSHBERGER: I think that is due to the leaf mould that is still present in the soil.

MR. NELSON: That is burned out by burning your clearing.

PROF. HARSHBERGER: If you had a forest fully cleared, you would find that leaf mould still present. It will go down a foot or a foot and a half into the soil, and burning over the top of the soil, would not burn that out. You would perhaps burn the loose material whereas this compact, black earth would go down a foot or two.

MR. NELSON: That would hold good in swampy land, but not in the conditions that I speak of. In our ordinary lands we don't have any leaf mould, down more than three inches, that is, where the ordinary burning has been done.

PROF. HARSHBERGER: I would explain that in that case, by saying that through all the ages, the organisms that exist, that are in the soil of the forests, are more of the denitrifying kind; they break down the leaf mould, and they are in larger number, and it takes some time for the germs that may be present to increase themselves in sufficient number to do that.

QUESTION. Might they not be destroyed by heat?

PROF. HARSHBERGER: Yes; I am very glad for that suggestion.

PROF. WATTS: Mr. Chairman, I would like to say that I remember a case not very far away, I remember that they sowed clover on a certain field and all that field was limed except a square block in the center of the field, and the clover was a perfect success except in the center where there was no lime applied, where it was a failure.

MR. NELSON: It is almost impossible in this country to get a right good catch of clover before the third crop after land is newly cleared, and I don't understand why unless it be the aeration by cultivation, wherein the exhaustion of the acidity would come in.

PROF. HARSHBERGER: Don't you apply lime to your soil?

MR. NELSON: It is not generally applied to new land. I don't know of any instance where we have applied lime to new land. I

wanted to ask you if the process of extracting nitrate from the air was likely to prove a success. You know we have several plants for that purpose at present.

PROF. HARSHBERGER: I don't quite understand.

MR. NELSON: The process of extracting nitrates from the air—is it likely to prove a success commercially?

PROF. HARSHBERGER: I can't answer that question, I have not followed the details of that.

MR. NELSON: You know they have a plant in Norway and there are one or two more in the process of erection for that purpose; it seems that their greatest difficulty is in the storage.

MR. HALLOWELL: When I first started farming, I remember there was an old machine out in the loft and I didn't know what it was, and the landlord was there one day and I asked him what it was, and he said, "Why don't you know what that is? That is a clover huller." When I look back to my boyhood days and think about the methods of farming then, and since I have seen this chart and seen how we have been deceived on seed, I have come to the conclusion that that has a good deal to do with our catch of clover. Our seed has been adulterated, and adulterated so that probably we sow more seed that don't grow than that that does.

A Member: Mr. Chairman, in my locality an application of wood ashes where there has been no clover sown for perhaps five years or more, will almost invariably bring in a good field of clover.

PROF. HARSHBERGER: I think that would naturally follow the application of potash in almost any form.

MR. NELSON: I have noticed a peculiar phenomenon. Being interested in bees, I got some bacteria with sweet clover seed several years ago and I find it is indigenous to this country; if it is sowed, it will grow in a square block or in little patches, and yet in soil down at a certain tunnel, I find that these seeds will germinate and grow in disintegrated rock, and I wonder why.

PROF. HARSHBERGER: I don't know why.

MR. BOND: Out in my neighborhood, there is some sweet clover growing wild and there is something very peculiar about it. I have been trying to cultivate it without success. It grows under the most unfavorable conditions very luxuriantly. I had some photographs taken for my friend Seeds, where it grows right on top of the cupola of an old blast furnace. I counted there from a single seed stool, thirteen stems averaging from five to eight feet high; it is growing with a growth of from five to eight feet right on the center of the slag bank where there is nothing but the slag of that furnace for twelve feet deep and yet it refuses to grow under favorable conditions.

MR. SEEDS: I have been growing that on my farm and I have got some seed from it and I am going to sow it again.

MR. HALL: Mr. Chairman, I would like to ask the Professor whether weather conditions have anything to do with the successful growing of such crops.

PROF. HARSHBERGER: I should think so, if you have a heavy rain or a dry period, I should think it would have a very material effect.

MR. HALL: Will you please give us the ideal condition of the soil?

PROF. HARSHBERGER: The conditions as I understand them are—the soil should never be acid; that can be decided by a litmus test; in the second place, the soil should not, as I said before, have a water-logged condition. The water should have drained through; there should be a certain amount of moisture, of course, but it should have been drained through into the subsoil, and there should be a certain amount of aeration, and also a certain amount of humus. Humus is not absolutely necessary, but there should be a certain amount of that in the soil, and there also should be a certain amount of lime. Those are the conditions, as I understand them, for inducing the production of the nodules on the roots.

MR. SEEDS: The farmers over Pennsylvania don't know whether they are a success until they dig up the roots and make an investigation.

PROF. HARSHBERGER: Well, they don't need to dig up the whole crop, I guess.

MR. HALL: I made some experiments in inoculating a field that would not grow clover with soil from a field that did grow clover; a part of it was a success and a part of it was a failure. A part of that land was put in on a cloudy day, and harrowed in, and a part of it was put in on a sunshiny day; now which of these days should have been successful?

PROF. HARSHBERGER: I think both of them should have been; I cannot see why there should have been any difference.

MR. HALL: There was a difference; that put in on the sunshiny day, I couldn't get any clover.

PROF. HARSHBERGER: It is possible that the sun may have dried it off perhaps so as to have killed the germs.

MR. SEEDS: I have been raising some alfalfa and it has not been a question with me in regard to nodules; I don't care anything about the nodules only so that I get the hay. I have a field situated between the house and the barn that has been sown to alfalfa this year. I don't care anything about the nodules, but I am going to plant that alfalfa—I am going to seed it the third time. My object is to plow down the alfalfa plants and get into that soil the food that produces alfalfa and see if I can raise as much as the western man.

PROF. HARSHBERGER: The mechanical condition of your soil is what you regard, probably.

MR. SEEDS: The question is whether I can be as successful without the nodules. When I get my roots down into the ground ten or fifteen feet, I believe I shall succeed.

PROF. HARSHBERGER: I should think it probable that you want soil accumulation in your soil.

MR. ORR: Mr. Chairman, I wish to announce that the Committee on Resolutions will meet to-morrow morning at eight o'clock in the hotel dining-room, and if anyone has any resolutions that they wish to present to the committee, he will please present them before that time.

MR. SEXTON: I will make the announcement now that the opening of the session to-morrow morning will take place at nine o'clock.

MR. McCLELLAN: Mr. Chairman, I would suggest that we meet at the hour appointed and not meet half or three-quarters of an hour later, as we did to-night.

The DEPUTY SECRETARY: I would say to the delegates present, do not forget the hour of meeting—nine o'clock in the morning; let us all be here promptly at that hour.

On motion, duly seconded, the meeting adjourned to nine o'clock to-morrow morning.

Court House, Clearfield, Pa.,
May 30, 1906, Wednesday, 9 A. M.

Chairman of the morning session, J. S. Burns.

MR. BURNS: Ladies and Gentlemen: The hour for opening this morning's meeting has already passed a few minutes, and it is our purpose to begin as early as possible, in order to keep pace with the requirements of the program. Now we wish that each of you be provided with the slips, so that you will be enabled to write upon these any questions which you may desire to ask upon these subjects. Especially we would ask you to do so on the part of Prof. Massey, whose hearing is a little defective, and also for Prof. Owens; we think it is the better plan, anyway. The first topic upon the program this morning, is entitled, "What Chemistry is Doing for the Farm," by Professor William G. Owens, Bucknell University, Lewisburg, Pa.

I now take pleasure in introducing to you Professor William G. Owens, who will now address you upon the subject named.

Prof. Owen's address is as follows:

WHAT CHEMISTRY IS DOING FOR THE FARM.

By PROF. WM. G. OWENS, *Bucknell University, Lewisburg, Pa.*

When we speak of farming and agricultural chemistry, we mention the oldest and one of the youngest sciences. The first began

in a crude way with the beginning of the human race, the second with the investigations of Liebig, just two-thirds of a century ago.

Some may question whether farming is a science. But if it is not, one of the principal objects of the agricultural chemist is to put it on a scientific basis. When Liebig, the father of agricultural chemistry, began his investigations sixty-six years ago, on the subject of nutrition, almost nothing was known upon this subject. At first the progress was slow and few followed this line of chemical research. Other fields offered so much larger returns in a material way for the time and money expended, that this work was taken up by few. Work done along this line would affect tens of thousands of farmers, and produce millions of money in the country at large, yet the share of profit coming to each individual is comparatively insignificant. A few more bushels of grain raised on each farm is worth millions of dollars to the nation, but only a few dollars to each farmer, therefore comparatively little was done in agricultural chemistry until the Government took up the subject, and now no government worthy of the name exists that does not carry on investigations in agricultural chemistry.

In speaking upon "What Chemistry is Doing for the Farm," note first that it is trying to discover what is needed by the plant and animal for its highest and quickest development. To do this, the chemist has analyzed every part of plant and animal, and found out the elements and compounds which compose them. He has next tried to learn in what form the elements must be supplied to the growing body to produce the best results. He has then ransacked all nature and the products made by man to find the proper materials capable of furnishing the nutriment needed.

In plant nutrition he has discovered that the only elements not furnished in abundance by most soils, are potash, nitrogen and phosphorus, but these are absolutely essential and no plant can make a proper development if either of them is wanting. They must also be in an available form; tons of them would be useless if the plant could not use them. On the other hand, they must not be in too great excess, or they will be lost by leaching out of the soil even if they do not kill the plant by their chemical action. A nice equilibrium must be maintained between demand and supply.

POTASH.

When the demand for potash was limited, it could be supplied by wood ashes, but as that supply became exhausted, the chemists of Germany put the great mines of Stassfurth on a paying basis and now the larger part of the world's supply is obtained there.

NITROGEN.

When it was discovered that nitrogen was used by plants and that the most available form was the nitrate, the deposits of guano off the coasts of South America were developed. When this source became exhausted, the nitrate of soda beds of Chili and Peru were opened up. As the price kept advancing, various forms of animal matters were utilized. Fish which were not edible and offal from slaughter houses were turned into fertilizers, furnishing nitrogen, thus using materials which a few years before had no value, and

were an expense to the producer. Not content to produce nitrogenous compounds which had already entered the animal kingdom, the chemist discovered the means of calling to his aid innumerable bacteria which have the power of fixing the free nitrogen from the atmosphere. But with all this the chemist was not content, and he has kept on experimenting until to-day it is reported that in Europe and America there are factories in successful operation fixing the free nitrogen of the atmosphere and making it available for plant growth. If this has really been accomplished, and the chemist has succeeded in transforming the nitrogen of the air into a compound available for plant food and at a slight cost, a new era in farming has arrived.

PHOSPHORIC ACID.

When phosphorus was needed for the growth of plants, bones were first used; later they were treated with acid to make them quickly available.

Phosphate rocks were next utilized, and after that certain linings of steel furnaces. Thus we see that the chemist has placed the principal inorganic fertilizers in the hands of the farmer.

Whenever he found products whether of nature's make or man's which contained the elements of fertility necessary for plant development, he devised a method of treatment which would make the food available for plant nutrition.

Knowing the value of the elements taken up by the plant enables the farmer to grow such crops as will exhaust the soil to the least degree, or if a crop which requires a large amount of a certain fertilizer is raised, that ingredient can be supplied in the greatest abundance.

The study of plant nutrition, which Liebig first investigated, has enabled the farmer to put on his fields just those compounds which will be of the most value to his crops.

The soil is not a dead mass as was once supposed, but is now known to be teeming with life and must be treated as such.

FINDING VALUE.

Chemistry helps the farmer by determining the value of what he produces, uses and loses. In feeding stock it is of great importance for the farmer to know not only what can be used, but what has the greatest feeding and manurial value. It often happens that a farmer can gain by selling part of what he has raised and buying some cheaper feed. The compounds found in feeds of most value are protein, fat and carbohydrates. These vary greatly in different feeds as bran, middlings, brewers' grain, linseed meal, cotton-seed meal, etc., but if the feeder understands the value of each, he can so buy as to get the best results for the least money.

NEW FEEDS.

Many new feeds have been placed at the disposal of the farmer through the work of chemistry. When cotton-seed was a nuisance to the man who produced it, and a nuisance to his neighbor as well as to the fish in the creek where it was usually thrown, the chemist took it, extracted the oil, which immediately became a valuable product, and produced from the cake a valuable cattle-feed and the

cheapest source of protein. The chemist has no small part to play in the marketing of many bi-products which but a few years ago were not only a drug on the market, but many of them had no value at all. By the methods now in vogue, there are few bi-products which cannot be utilized to feed either the animal or the soil.

FEED VALUES.

The chemist has not only determined what elements are needed by the plant or animal for its best development, but he is trying to determine in what form and quantity they should be introduced to produce the best results. Much valuable food is wasted by improper use. Feeding standards have been made out for different animals, and by following these more or less closely, the farmer can get the highest value out of the materials at his command.

Not content with things as he finds them, the chemist has enabled the producer to improve his product. By the invention of the Babcock Milk Tester, the chemist at the Wisconsin Experiment Station has placed in the hands of every farmer, a means of testing the value of his cows. By proper selection and breeding it is possible to greatly improve a herd of cattle, and send the "boarders" to the butcher's block.

By analyzing the different parts of a grain of corn and noting its physical appearance, the chemist has enabled the grower in the great corn belt, to produce kinds of corn which differ widely in their chemical contents. One kind is used for growing cattle, another for starch or other purposes. Wheat has also been differentiated, and the raising of macaroni wheat has become a distinct business in some localities.

Secondly, the chemist does not only introduce the farmer to his best friends, the fertilizers and feeds, which help him produce the largest crops and best herds, but he also has tried to protect him from his enemies. Of these enemies there is first himself, often the farmer's greatest enemy is his own wastefulness. He does not know how to care for the manure produced on the farm and the chemist has shown him that almost a hundred million dollars' worth of fertility every year goes down the Mississippi River, and even this is only a fraction of what is annually lost in the whole country by the improper care of manure. Again, in the treatment of his stock, sometimes he over-feeds, and again he under-feeds.

PROTECTION AFFORDED BY CHEMISTRY.

Chemistry protects the farmer from those who would impose upon him. Scarcely had the farmer begun to use fertilizers until all kinds of materials were sold to him as high grade goods. Before the days of the public chemist, carloads of pulverized sand were sold to unsophisticated farmers of Pennsylvania as deodorized Peruvian guano, but since the chemist began his work, all this has been changed. Now every progressive country in the world employs a number of chemists who devote their time to analyzing fertilizers and seeing that they agree with the formulae marked on the container.

Another gigantic fraud is the sale of artificial butter under the name of cow butter. While it is perfectly proper to sell oleo under

its proper name and mark, every one must agree that it should not be allowed to replace the product of the cow. Chemistry also protects the honest milkman from the man who buys old milk and preserves it in a like case. There are also many other kinds of adulterations which time does not permit me to mention.

The farmer has another class of enemies from whom the chemist tries to protect him. It is the insects which infest his trees, vegetables, seeds, etc., which must be killed. The scale and fungus growths must be combatted. For all of these the chemist has been trying to find a remedy and in most cases has succeeded if the cure is properly applied.

THE REIGN OF LAW.

The highest service which chemistry is doing for the farm, is to make the farmer realize that he and the growth and development of all things on the farm, are under the reign of law. There is no such thing as chance or luck. Often when a man loses a crop or an animal, because he contravenes the laws of nature, he says he had bad luck, or lays it to Providence, but he must learn that his verdict is no more just than of the Texas coroner's jury who sat on the case of the cow-boy who committed suicide and who had many friends who thought suicide a disgrace. The cow-boy, after nearly killing himself with drink, took a half ounce of arsenic, swallowed an ounce of laudanum, opened his arteries with a razor, and sitting on the window sill, put a bullet through his heart and fell five stories to the flag-stones below, breaking his neck. The jury, out of respect, brought in the verdict, "Died by the intervention of Providence."

The farmer must realize that he is living in a world governed by law, and when he follows the law, all goes well, but when he follows his own ideas, that does not change the law. Luck and the moon, and all the other signs will be of no avail to the man who does not think. The lively discussion which followed the learned papers of Professors Duvel and Harshberger last night, show that in this audience there are many who have been thinking, and the greatest service that the chemist can do for the farmer, is to help him solve the problems which thinking will call forth.

A Member: Mr. Chairman, in our locality we have been feeding gluten meal and some farmers claim that it pays to sell their corn and buy the gluten meal. I would like to ask Prof. Owens what he thinks of that.

PROF. OWENS: That would depend entirely upon the price of the two; it is necessary for the dairy to keep supplied with a certain amount of protein and by working out that equation, it is possible to determine the question. You must take into account not only the value of the materials, but also take into account that certain feeds do not agree with meal when fed in excess, but leaving that out of the question, it is possible to determine exactly how much of any given compound ought to be fed to cattle to produce the best results. It would be impossible to say offhand whether it would be best to sell the corn and feed the gluten meal, or to feed the corn.

MR. HUTCHISON: Mr. Chairman, I would like to ask Prof. Owens if the gluten meal would not be a great deal higher in protein.

PROF. OWENS: Yes, if you wanted protein, then the gluten meal would be the material you would want to get; of course just what you want is the thing that requires consideration in determining what to use.

MR. PHILLIPS: Mr. Chairman, it seems to me that there is another question that comes in here; the gluten meal is a heavy, concentrated food, and cannot be fed in large quantities with impunity. I think it contains somewhere in the neighborhood of five per cent. of protein, and is the most successful food where that is needed.

I want to say this, that there are other food products not quite so high in protein, and yet very desirable as feeds, and in addition to what the Professor has said, as to the requirements of a certain number of pounds of protein that an animal ought to have in twenty-four hours, there is still another important question and a very important one too, and that is the question of health.

PROF. OWENS: Yes, you must always include in your standard the health of the animal, which would be more or less of an individual factor.

QUESTION: Is there positively nothing in the signs of the moon for planting crops?

PROF. OWENS: I think as long as you plant upon the earth, there is nothing in the signs of the moon.

MR. HUTCHISON: Hasn't the moon an effect upon the tides upon the earth?

PROF. OWENS: Yes, certainly it has.

MR. HUTCHISON: Might it not have some effect upon the earth as well as on the tides?

PROF. OWENS: I don't know that any effect has been discovered.

MR. HUTCHISON: Might it not be possible?

PROF. OWENS: I do not say it is absolutely impossible; there is more in nature than our philosophy includes.

MR. R. P. KESTER: What difference between commercial nitrate of soda and salt-petre?

PROF. OWENS: Nitrate of soda is sodium nitrate. Salt-petre is obtained largely from India and sodium nitrate is obtained largely from Chili. Potassium nitrate, if you could afford that, would furnish the two elements at the same time, would give you the nitrate and potash both, whereas the nitrate of soda only gives the one.

DR. FUNK: Which is the cheapest to use?

PROF. OWENS: I haven't figured that out. You could easily do that; any one can do that and arrive at the absolute amount of

potash you get. Take then your nitrate of potash and calculate the absolute amount, and after that the value of the nitrate that is in it; it would be possible to determine very easily and accurately what is in it. It is simply a matter of calculation.

DR. FUNK: The nitrate of soda will cost you about fifty-two and the other will cost you about seventy-five. Now which is the cheapest?

PROF. OWENS: I have not determined it; I have not figured it so am not prepared to say at the present time.

MR. FENSTERMAKER: Give some information about the process of extracting nitrogen from the air by electrical instruments.

PROF. OWENS: I don't know; I haven't seen any statement of the exact apparatus that is used. Prof. Harshberger, have you seen that?

PROF. HARSHBERGER: No, I don't know anything about that. The nitrogen can be obtained by passing a very powerful current through the air under certain conditions, but the processes, so far as I have seen, have not been published. I have not noticed them in any scientific journal, therefore more than that general statement I could not give.

MR. NELSON: I believe that the *American Inventor* described that process completely. I wish I had brought it along.

PROF. OWENS: I wish you had.

MR. MILLER: Has the chemist succeeded in putting all farmers to thinking, or what per cent?

PROF. OWENS: That is a question I would like to have answered myself. I am sure they are beginning to think, and farmers are waking up, and when the time comes that they properly appreciate the possibilities that are open to them, and when they utilize the materials that are lying all around them, there will be accomplished far better results. You have no idea of the amount of waste there is all around us, until you begin to think of it. Coming here from Williamsport yesterday, we came through certain sections of country where we saw the remnants of thousands of pieces of lumber that had been allowed to go to waste. You travel through Germany and go into the forests there, and you will find them almost as free from sticks as the streets and parks are here in the cities. After every storm the women go out and gather up these things, or the old men, or the children, so that nothing is wasted. Here you go out into these forests and millions of feet of lumber are allowed to go to waste.

MR. HUTCHISON: Would that not improve that soil from the farmers' standpoint.

PROF. OWENS: It may leave a little potash and that is about all. I only speak of that as one sample of the waste that goes on continually in this country, and the farmer fails to appreciate it; there are of course, many other wastes.

MR. DRAKE: I would like to ask a question relating to the subject of feeding. I am a cattle feeder, you may say, at least, I am feeding some cattle on pasture. Now the question I wish to ask is, Do I need to have a grain carrying a very heavy per cent. of protein?

PROF. OWENS: Are they cows or steers?

MR. DRAKE: Steers.

PROF. OWENS: Without looking up the matter, I should think that you would not need to carry very much protein in that case.

MR. DRAKE: Would you say that the pasture will supply enough? It is a good, blue-grass pasture.

PROF. OWENS: I should think it would supply nearly enough protein, but I would not like to be quoted as authority on that. You can get the Bulletin and see just exactly what is required. You must feed every animal for a certain purpose. In the case of the cow you are feeding for milk, and in the case of the steer, you are feeding it for fat, and so of course you must apply that doctrine to the compounding of the feed.

A Member: Is cottonseed meal dangerous to feed to cattle?

PROF. OWENS: Well, it is, unless you feed it in safe proportions; that is the cheapest form of protein that you can feed, but you must know what proportion is safe. I think that something like a pound and three-quarters, not over two pounds, would be about the amount; but as I say, I do not have these figures in my head; I would prefer that you would look them up in the Bulletin from those people who have carefully worked them out.

MR. BILLINGS: Does cottonseed lose value by age?

PROF. OWENS: Cottonseed of course, is a highly organized seed, and if not properly cared for, would lose value, and might present some danger if decomposition takes place in the cottonseed, but if properly taken care of, there would be probably but a small loss.

MR. HUTCHISON: Where feed is damp in a shed, it loses very rapidly; the protein is not likely to lose so much but you must be careful in keeping the feed in a proper and suitable place where you buy a ton or two, or you will lose a large percentage of the fat.

MR. BLYHOLDER: What effect or what change in the feeding value does the heating of corn have? In our section of the country there is quite a good deal of corn sold now by one certain merchant that heats on the cob. I would like to know what effect that has upon the feeding value?

PROF. OWENS: That lowers the fat; it don't affect the protein so much, but it lowers the fat.

MR. BLYHOLDER: What effect would it have?

MR. HUTCHISON: Well, the cattle don't like it.

QUESTION: After it has passed a certain stage, as I understand, it is positively dangerous to feed it.

PROF. OWENS: Yes.

QUESTION: I would like to ask a question in reference to sunflower seeds. How do sunflower seeds compare in feeding value with cottonseed?

PROF. OWENS: They have an abundance of fat, and also considerable protein, but I could not give you the comparison with cottonseed.

PROF. MASSEY: We had a perfect epidemic in North Carolina of scours in horses and it was traced to that very thing, the feeding of damaged, mouldy corn, and mouldy feed of any sort is likely to produce that effect.

PROF. OWENS: Of course in the case of any feed that is spoiled, mouldy hay or corn or anything, it should be avoided, because that is not a proper food; it has passed the condition when it is a proper food for the animal to eat, and if you use it you always run the risk of bringing on disease of one kind or another by using that kind of food.

The CHAIR: The time has arrived when we should take up the next subject. Now allow me to repeat what I said in the morning; Prof. Massey who will address you, his hearing is somewhat defective, and he has asked that those of you who wish to ask him questions, will please write your questions upon these query slips.

I now take pleasure in introducing to you Prof. Massey the editor of "The Practical Farmer." His subject is "Soil Improvement."

PROFESSOR MASSEY: Mr. Chairman, Ladies and Gentlemen: I thank you for the welcome to Pennsylvania. There was a time when we men wearing the gray clothes were welcomed rather warmly by the burning of powder, and they were rather careless in the use of their guns.

I would rather look my audience in the face and talk to them, but in this case, in order to keep myself in line, I have prepared a paper and I shall ask your indulgence while I read it, as the subject is one of recognized importance, and I want to say what I have to say as concisely as possible.

The paper of Prof. Massey is as follows:

THE IMPROVEMENT OF THE SOIL AND THE MAINTENANCE OF FERTILITY.

By PROF. W. F. MASSEY, *Editor, "Practical Farmer," Philadelphia.*

There is no more important problem for the farmer in the older sections of the country than the improvement of the productive

character of his soil, and the maintenance, in an economical and business-like way of this productiveness and fertility. In all the older sections of the country there is no phrase more commonly used in speaking of a depleted soil, than to say it is "worn out." The real fact is that we have no really worn-out soils. We have soils in many localities which were originally fertile and productive, but which, through a long course of injudicious treatment and cropping, have gotten into a very unproductive condition. We have other lands that never had any store of fertility to be worn out—deep sands, which are naturally barren.

The "old fields" of the South are good examples of what men call worn out soils. They were cropped year after year in the old one-crop system till no longer producing a paying crop by the shallow plowing and methods of cultivation to which they were subjected, and have been turned out as perfectly worthless and utterly worn out. What then takes place? The ever-present broomsedge soon covers the land, and sods it over with its strong roots. Down among the broomsedge the pine seed, borne on the wind, find a congenial shelter, and a thicket of old field pines grows up. The pine tree has a wonderful subsoiler in its deep tap root, and it strikes down into the soil which the little one horse plow of the past never touched and year after year brings up food from below, and covers the earth with its fallen leaves making humus to replace that which had been used up in the careless cultivation of the past. After a while the forest is cut down for firewood and the owner finds that he has a new and fresh soil, which will make as much cotton or tobacco as it ever did. Nature has made this fertile soil by processes of her own, and with no help from the fertilizer manufacturer. But for the broomsedge and the pine tree a large part of the Southern uplands would to-day be a howling wilderness. If the man who clears the pines away goes on again to reduce the fertility of the soil, and finally turns it out again. Nature will renew the process, and will show that there is in all of our soils which are of a good mechanical composition, and originally productive, a practically inexhaustible supply of plant foods with any sort of proper management. What is it that Nature does for the restoration of the soil through the long years she takes to cure man's improvidence? Merely getting deeper into the unused store of mineral matter that had not been touched, and putting the accumulated vegetable matter on the surface soil to decay and restore the humus content to the soil which the constant cultivation of the past had used up. It takes unaided Nature long years to accomplish this, while all that she does the wise farmer can do in a few short years if he learns what is needed and the method of getting it.

One of the chief deficiencies in our old cultivated soils is organic decay making what we call humus. We are but just getting to realize the importance of this humus. It is valuable, not altogether for the amount of plant food it contains, though it does furnish a large part of the nitrogen, which is so hard to keep in good supply, but by reason of other effects which it has in the soil. It darkens the color of the soil, and hence makes it more retentive of heat. It prevents a clay soil from running together and baking hard in dry weather. Through the acids it contains it has a great solvent effect on matters of plant food otherwise insoluble, or very slowly

so. Chemists in the Experiment Stations have for many years been dividing up the phosphatic fertilizers which have been treated with sulphuric acid into the soluble, or water-soluble, the reverted, or citric acid-soluble, and the insoluble. Many of the Stations in their estimates of the value of the fertilizers carrying phosphorus have placed no value at all on the insoluble phosphoric acid in them, or at best a very low value. But we are fast learning that some things happen in the great laboratory of Nature which our little laboratories told us nothing about, and it has now been found that in a soil abounding in humus we may place the insoluble pulverized phosphate rock, and it will rapidly become soluble and available to plants. But equally important is the fact that humus is more retentive of moisture than anything else that goes to make up a soil, so that a soil abounding in humus will stand more drought than soil of any other character. The vast importance of this fact will be realized when we reflect that plants cannot take any food from the soil until it is in perfect solution in the soil water. Hence the retention of moisture for this purpose is of the greatest importance.

But if you will pardon me, I would like to digress a while from the direct subject, and endeavor to explain to some extent how plants which make up our crops grow and get their food from soil and air. There is more ignorance in regard to the anatomy and functions of plant life, even among men considered educated, than about anything else appertaining to agriculture. But in order fully to understand how we are to improve our soils and make them more productive in crops, we should fully understand how plants live and grow in order that we may know how and with what to feed them.

There has been a great deal said of late years about a certain order of plants, the legumes, which, through the agency of certain minute organisms of the low order of plant life, known as bacteria, are enabled to get and combine in an available form the free nitrogen that exists so abundantly as a gas in the air. Of these will speak later. But it is not so generally realized that all plants get far more of their structure from the air than they get from the soil. More than ninety per cent. of the organic structure of every plant comes from the air, and less than ten per cent. from the soil. Growth in plants is made by the increase in number and size of little box-like structures called cells. Cut across the stem of any woody plant and examine the cut end with a lens of even moderate magnifying power, and you will see that the rings of growth are really circles of these cells, larger and thinner walled in the spring, and gradually becoming smaller and thicker walled as the close of the season of growth is reached, so that to the naked eye they merely look like rings. These little cells are filled at first with a formless substance similar to the white of an egg, which biologists call protoplasm. This is the only material in the plant that possesses life, and this formless living matter carries with it and constructs the material of which the cell walls are made. In short, the growth of a tree is made of constantly increasing circles of cells somewhat after the manner of building a wall with bricks, only that in this case the brick-maker and the mason live inside the bricks and form from their own substance the walls that confine them. In the first thin growing

cells between bark and wood the living matter in the cells is in continuous connection throughout the growing tissues. Later on, as the cell walls thicken, each lives to itself and carries on the making of the wood until all the living matter is used up and the wood is finished, and we call it "heart" wood, really dead wood, for the heart of a tree merely remains to hold the tree in position, while the life goes circling on around it. The heart may decay and the tree get hollow, but it will keep on growing, but if you cut through the growing cells all around the outside of the tree it will be killed.

The leaves as well as other parts of the tree are made up of these cells, but in these the living matter contains certain green granules which can easily be seen under the microscope, and which from their abundance give the naked eye the characteristic color of the leaf. In every leaf, and especially on the under side of the leaf, there are numerous minute openings which require a microscope for their detection. On each side of these openings there is a cell shaped like our lips, which give the openings the appearance of mouths under the microscope, and they are really the mouths through which the plant gets food from the air. In some leaves there are 70,000 of these minute pores to the square inch. They open into the interior of the leaf where the cells containing the green matter are loosely arranged. During the hours of sunshine, and at no other time, these mouths are open, and they close in sunshine when a plant wilts from lack of moisture so as to check evaporation and give the plant a chance to recover. In the air there is always a small percentage of carbon dioxide or carbonic acid as it is commonly called, which when in excess is poisonous to animal life. When the sun shines the mouths in the leaf open and the air with the carbon dioxide enters the leaf and comes in contact with the green granules. This green matter has the wonderful power to break up the combination of carbon and oxygen throwing back the oxygen to purify the air and taking the carbon for the use of the plant. Then in the leaf laboratory the food brought up from the soil in the soil water taken in by the roots is combined with this carbon and the living matter uses it for the work of what we call growth. The nitrogen, coming from the soil, continually renews the vigor of the living matter, while the materials from the air, which scientists call carbohydrates, because they are composed of carbon, hydrogen and oxygen, are used by the living matter to construct new cell walls and woody material. While the great bulk of the plant structure thus comes from the air, the matters that the roots take from the soil are nevertheless of vital importance. Let us study the root and see how the plant gets these materials from the soil. Place several layers of thick blotting paper in a saucer and wet them. Then on the wet paper lay some seeds of ordinary string beans. Cover the saucer with a pan of glass and set in a warm place. They will soon sprout and throw out roots over the wet paper. By examining these carefully you will see that the extreme tip is pointed and naked, making what is called the root cap. New cells of growth form back of this root cap and push it forward through the soil, and renewing it as it wears away on the outside from behind. Just back of this root cap you will see that a portion of the root is covered with a velvety coating of minute hairs. These root hairs are the only part of the root engaged in taking in food from the soil, and from

their minute size it is easy to understand why the food must be in solution, for these little hairs cannot absorb anything of a solid nature. As the root progresses in the soil the root-hairs dry up and new ones are produced back of the root cap, so that the roots are ever foraging in fresh soil. Since these root-hairs are the only parts of the roots engaged in taking food from the soil, and as they are always near the remotest tips of the roots it is easy to see why the man who runs a big plow through his corn and tears off the roots is depriving the plants of the power to get food from the soil till new rootlets are formed.

Knowing these facts in regard to plant life, how shall we apply them in the improvement of the fertility of our soils? The importance of the moisture-retaining character of humus in the soil will be better understood when we fully comprehend the need for the solution of the plant food for the minute root-hairs. There are a number of elements that must be supplied in the soil water in order that plants may live and grow, and if any of them are entirely absent the plant cannot thrive. These elements are nitrogen, potassium, phosphorus, magnesium, sulphur, sodium, iron, chlorine, silicon and calcium. Some of these are only used in minute quantities and some only by certain plants under peculiar conditions, and most of them are in such abundance as to be practically inexhaustible. Those which are used freely by all crops, and most apt to become deficient in the soil are nitrogen, potassium and phosphorus, and in rare cases calcium or lime. Nitrogen, potassium and phosphorus exist in smaller amounts than other essential elements in all soils, and are most rapidly taken up by crops. They exist in greatly varying amounts in different soils. A soil may be rich in nitrogen like the black prairie soils of Illinois, and yet be deficient in phosphorus, as has been shown there, and in hill lands like those of southern Illinois, potassium may be abundant, while both nitrogen and phosphorus are deficient. Some years ago I was invited to lecture at an Institute in one of the southern Illinois counties, and the subject assigned me was the restoration of worn out land. It seemed odd to me that Illinois farmers were already considering the exhaustion of their soils in a section formerly known as Egypt, from its great productiveness. When I reached there, however, I found that reckless farming and bad treatment of the soil resulted in the same conditions in Illinois as they do elsewhere, and I found washed hillsides and unproductive soils there, just as they exist in the uplands of the South and from the same causes. When I was a young man I was engaged in making railroad surveys from Minnesota to Texas. On the rolling prairies of the Grand Divide in northeastern Missouri they were then just turning the raw virgin sod, and they laughed at the idea that their soil would ever need manure, and boasted that they made 25 bushels of wheat per acre while eastern farmers made 10 to 15 bushels. But last year the farmers of Missouri paid two million dollars for commercial fertilizers, for their lands had gone down to 10 and 15 bushels of wheat per acre, while the lands in eastern and northern Maryland had gotten to making 40 bushels of wheat per acre in many counties. They have found that the essential elements for crop production can be exhausted in any soil, and that to keep up production some means must be taken to repair the waste. Single cropping has brought the famous

wheat lands of Minnesota and the Dakotas down to half the yield of these old Maryland soils.

Years ago, when wheat had fallen from the inflated price after the Civil War to \$1.00 a bushel, I was traveling on a Chesapeake steamer to one of the best wheat growing counties of Maryland, and in conversation with a farmer, he said that they would have to give up wheat, for it could not be grown for \$1.00 a bushel with any profit. At that time, and by the old methods of farming with the annual use of complete fertilizers, they rarely made over 15 bushels per acre and generally less. Since then that same farmer, and many others in the same section have grown wheat at a greater profit for less than a dollar than they did when it was higher. Conditions required better farming, and the farmers rose to the conditions and succeeded. One of my oldest friends in that section, who died a year ago at the ripe age of 86 years, and was an enthusiastic farmer up to his death, told me two years ago that thirty or more years ago, like all his neighbors, he was farming in the old way and spending a great deal of money for complete fertilizers and made 15 bushels of wheat per acre and often less. But that for the past twenty years, by the adoption of a short rotation and close attention to clover, he has averaged 40 bushels of wheat per acre, and 50 bushels had been made in the neighborhood, and that during that time the only commercial fertilizer he had bought was plain acid phosphate for the wheat that cost him an average of \$9.50 per ton, and his corn crop had gone up from 40 bushels per acre to 75 bushels.

Recently certain alarmists in Europe have been prophesying dire calamity to the world by the failure of the wheat crop from the exhaustion of the supply of nitrate soda and other sources. They claimed that there would be a wheat famine all over the world if some new source of nitrogen was not discovered. Most of these statements were evidently for the purpose of booming the newly discovered source of nitrogen in calcium cyanide. But these Maryland farmers found years ago what I have been trying for a generation to impress on the minds of farmers in all parts of the country, that in any ordinary grain farming, the farmer who buys artificial nitrogen in any form is wasting his means for something which he can get without cost, and can even make a profit in the getting. Market gardeners whose crops have a special value and need early forcing can afford to buy nitrogen, but the farmer whose interest is in grain production need never buy an ounce of nitrogen in any form, if he farms right.

Professor Hopkins of Illinois recently said, "As a matter of fact at least 99 per cent. of the crops of the world are being produced without the use of commercial nitrogen and without artificial soil inoculation, and where abundant use is made of the legume crops in rotation, it will be possible in all future years, as it has been during the thousands of years in the past, for farmers to maintain a sufficient supply of nitrogen in the soil without the purchase of any artificial nitrogen. . . . There is more nitrogen in the atmosphere above every quarter section of land than is required for the entire annual corn crop of the world, and while bacteria work for nothing and board themselves, living on the roots of the legume crops and transforming free atmospheric nitrogen into combined forms for the use of growing crops, there is but one conclusion to be drawn in

regard to the great nitrogen problem, and this is, that there is no such problem except in the minds of people who ignore these facts."

We cannot too often repeat the fact that the farmer who practices a good short rotation, in which the legumes come frequently on the land, needs never to buy a complete fertilizer, that is one containing nitrogen as one of its constituents. The importance of this fact can be seen when we reflect that in the usual complete fertilizers on the market the cost of the nitrogen equals or at times exceeds that of the phosphorus and potassium in the mixture. It has been proven beyond any reasonable doubt that the agents which enable the legume plants to combine the free nitrogen of the air are the bacteria which live parasitically on the legume roots. It has been shown that unless these are present the legumes do not get the nitrogen, and that when they are present they do get it. Various theories have been promulgated to explain just how these bacteria do their work, but the exact method is still unknown, and it matters little to the practical farmer, since, for his purposes it is sufficient to know that they do get it. But every now and then some one rises up to say that the scientists are wrong. In a recent English daily paper one of these know-it-alls says that the idea that the bacteria do the work is all wrong, for that all plants have the same power, and all get nitrogen from the air through their leaves, and that the best way to increase the nitrogen in the soil is to use Thomas slag liberally. Since this slag is entirely composed of phosphorus, lime and magnesia it is hard to see how it can increase the nitrogen in the soil unless used to promote the growth of the legume crops. As a rule farmers should pay no attention to the science of the daily papers, for the average newspaper reporter is the most gullible of mortals about anything relating to scientific agriculture.

While we can get all the nitrogen we need in general farming from the air, we cannot get phosphorus or potassium, and when these are deficient they must be restored to the soil in some way. The element most generally deficient in our old cultivated soils is phosphorus. It is taken from the soil to form the bones of every animal raised on the farm, and the grain crops use it up readily. Potassium exists in most of our clay soils in abundance, but is apt to be deficient in sandy and especially in peaty soils like reclaimed swamp lands. In our clay soils it exists in the form of an insoluble silicate, which is slowly made available by the carbonic acid in rain water, and can be made more readily available by the use of lime or plaster. The chief problem for the farmer is to determine whether it is cheaper for him to get at the potassium in his soil or to use the potash salts.

The question is then narrowed down to the keeping up in the most economical way the supplies of phosphorus and potassium and putting them in a shape most readily available to crops.

When these are deficient, they must be added in some artificial way to the soil, and it depends very largely on the conditions surrounding the farmer as to how he shall do this. If he is so situated that he can profitably buy and feed the grain which has been grown on some other man's land, he can restore these elements and can keep up the fertility of his soil without the purchase of commercial fertilizers. Where he cannot do this with profit, he must buy these elements in the forms in which they are sold on the market. It is

merely a question of conditions under which a man is working. The main difference between his fertilizer and the commercial article is that in applying the barnyard manure he is adding humus-making material to his soil, which the commercial fertilizer lacks.

And right here comes in a question of farm economy. In what way can we get this humus-making material most economically? Shall we depend on hauling it there or shall we grow it already spread over the land by the use of the mineral fertilizers used on legume crops? As a rule, the best farming is done where some form of live stock husbandry is practiced, but it is nevertheless perfectly practicable to increase and maintain the productiveness of our soils through the use of legume crops, aided by the mineral elements used for the increase of these crops, and there may be farmers who will find it more economical in their conditions to have the humus-making material grown already spread on the land than to haul it there laboriously in the form of barnyard manure. Of course I would never advise carelessness in the making and use of the manurial accumulation which necessarily occurs on all farms. But I differ from many, who would under all conditions make a sort of fetish of a manure pile, and think that all farmers can afford to feed cattle at an actual loss and make it good in the manure.

As a rule, in many cases, it will be found that there has been a big price paid for the manure. By the proper use of the artificial forms of potassium and phosphorus for the increased production of the legumes it is perfectly practicable to get increased supplies of combined nitrogen for the use of succeeding crops, and to get a far larger amount of humus-making material than we could possibly afford to haul there in stable manure.

But again the matter of farm economy comes in. This course assumes that all the legume crops are to be used directly as manure. We have grown, for instance, a crop of clover or cow peas which will make at least two tons per acre. This hay is worth for feeding on the farm \$10 a ton. Can we, for any of our ordinary farm crops, afford to bury \$20 worth of valuable feed in the soil as manure? This question becomes all the more important when we understand that in feeding this hay we can, by any reasonable care of the manure, recover at least 75 per cent. of its manurial value, and perhaps more, so that in burying it as manure we are losing the feeding value, so that the cases are very rare in which it will pay a farmer to ignore live stock feeding and depend on "chemicals and clover" for the increased productiveness of his acres. It is rather a question of possibility than of profitability, so that, argue as we may, we come back finally to the fact that the growing of forage crops, and the feeding of live stock, lie at the very foundation of improved agriculture with the great majority of farmers. We are too apt to consider only the market value of the feed in estimating the cost of animals fed, instead of the actual cost of the production of the feed, and the loss to the farm in selling it.

This brings me finally to the consideration of the practical methods for the improvement of the productiveness of our soils. In lecturing last winter at Institutes in Bucks county, near the city of Philadelphia, I was surprised to notice so little clover, and on urging the farmers to give more attention to clover and a shorter rotation I was met by the response "We cannot grow clover any more." The

same statement is made in all parts of the country in places where clover has thriven in the past, and the difficulty in getting clover seems to be very general. Two years ago I was requested to address the farmers of East Tennessee at their annual convention in the city of Knoxville on the Southern Cowpea. After I had concluded my address a farmer took the rostrum, and in a very emphatic way declared that he did not want the pea, and that the clover was the crop for him. I interrupted him, and told him that I had not said a word against clover, but would like to know why they did not grow it, for I had ridden the day before down the beautiful limestone valley of the Tennessee from Asheville to Knoxville, in the month of May, and had not seen one decent field of clover? The audience of 2,500 of the best farmers of East Tennessee applauded loudly at this, and many of them told me afterwards that the man who was so fond of clover utterly failed to grow it as most of them did. I told them then, and would repeat it now, that I believe the failure of clover, where it formerly succeeded, is due to one of two causes, either the exhaustion of elements in the soil needed by clover, or soil acidity, which is death to the bacteria that live on clover roots and get nitrogen for it from the air. Generally both conditions are present where clover fails. The farmers in Bucks county have been running their lands in timothy to sell hay in the market of Philadelphia, year after year till the hay crop is too small to pay before breaking the land again. The long and exhausting rotation is the chief trouble, and the soil has become acid thereby. Many years ago I took a farm in Maryland just south of the Pennsylvania line. It was a beautiful limestone valley, and the soil was fertile and well supplied with humus, but one field was pointed out to me as being clover sick.

I never took much stock in the clover sick idea, and I gave that field a good dressing of lime, and never saw finer clover than grew on it the next year. The soil was simply in an acid condition, and the lime restored the conditions in which the bacteria thrived again.

The most thoughtful men in all parts of the country are fast coming to the conclusion that the constant use of the dissolved phosphate rock, or acid phosphate as it is called, has been the cause of soil acidity in many sections. We were not at first disposed to accept this, because we knew that manufacturers of acid phosphate were very careful not to have any free sulphuric acid in their goods, as it would interfere with the drilling of the article. But the investigations of the Ohio Experiment Station seem to throw further light on the matter. Dr. Thorne, the Director, believes that the effect of the acid phosphate in creating acidity in the soil comes from the fact that the soluble phosphoric acid is taken up rapidly by the crops, and the sulphuric acid is set free and at once combines with the lime in the soil, and forms lime sulphate, which does not sweeten the soil as the carbonate does. The soil, being thus robbed of lime, becomes acid and clover fails to thrive until lime is again added. He has found too that when the pulverized phosphate rock or "floats" is used in connection with stable manure it rapidly becomes available to plants and the use of this pulverized rock will entirely do away with the difficulty attending the use of the dissolved rock, in case the soil is well supplied with humus-making organic matter. Here again we see the importance of humus. The old long rota-

tion, in which the land is mown till it no longer makes paying crops of hay, so reduces the humus in the soil, as well as the mineral matter, phosphorus in particular, that clover does not find the food it requires, and the soil has become so acid that the nitrogen fixing bacteria do not thrive, and hence clover fails. The remedy is a shorter rotation of crops, legumes more frequently grown and fed on the land, the humus content of the soil increased by the legume roots and the manure made from feeding the hay, the growth of which has been promoted by applications of the phosphatic fertilizers and an occasional liming.

But here is where many farmers have made a mistake. Noting the good effects of a first liming of the land, they jump to the conclusion that lime is all the manure they need, and they use it in a lavish way, only to find finally that lime no longer gives them the great results it did at first, and that they are compelled to resort to commercial fertilizers. I know of sections in this State where, in my college days, the farmers applied 100 or more bushels of lime per acre, where on the same lands now but 25 bushels is used, since the farmers have learned the true office of lime, and have discovered that a smaller amount per acre applied more frequently in connection with the legumes, is better than a large amount applied with the notion that lime is a manure.

It is by no means the purpose of this paper to lay down rules for every farmer to adopt in the rotation and cultivation of his lands. That would be pure agricultural quackery. We must assume that every farmer who is a student of his profession, is wise enough to adapt any suggestions that we make to his own conditions. What we wish to impress on the farmers is the importance of a shorter rotation of crops, the regular use of legumes for increasing the available nitrogen supply and the humus in the soil and the feeding of stock better than timothy ever will, the giving to the legumes abundantly the mineral elements of plant food which they need in order to do better their work of nitrogen fixation, and leaving them to do the rest. In brief, the office of the commercial fertilizers should be the feeding of the crops that feed both the soil and the stock. If the legumes are well supplied with phosphorus and potassium you may depend on their producing the sale crops and feeding the stock. Just what a man's rotation, and what his money crops shall be must be determined by the man himself from his knowledge of his own conditions. But it is evident that the successful farmer of the future must be a legume farmer, and the man who puts his greatest efforts into the production of the legumes and the feeding of the forage will always have the money crops in larger amount than the man who gambles with a complete fertilizer merely to get more to sell off his land direct. On most of the soils of Pennsylvania the pulverized floats and lime will be all that he need buy for his land, and the legume farmer who keeps up with the advance in modern scientific investigations will farm more cheaply than the fertilizer gambler, while having more crops to sell. But he must be a student of his soil. Our soils vary so much even on the same farm, in their mechanical make-up and chemical composition, that different treatments and different fertilization are required. The chemist can tell you what a soil contains, but he can give you little information as to the availability of the matters in it, and the only man

who can find out what a soil needs is the man who cultivates it, and he must do it by careful experimentation year after year with the various forms of plant food separately and in combination as compared with check plots, and in this way can come very closely to what his soil is deficient in and what he need not buy. Crops vary too as to what they take from the soil, and the needs of special crops as well as the needs of the soil must be studied. One point I have reserved till now. This is the preparation of the soil for crops. A deeply prepared seed bed is of course important, but we must go slow in the deepening of a soil that has been plowed shallow for generations. Then whether subsoiling will pay or not will depend on the nature of the land. A flat clay that needs underdrainage will not be benefited by subsoiling till the drainage is made good. But on most of our rolling lands with a clay subsoil once in each round of a four year rotation will be found of advantage. But one thing is important, and this is a complete pulverization of the surface after plowing. I have found that in the preparation for fall grain every time the harrow went over the land till completely fined and compacted I was adding bushels to the crop.

When finally all our farmers know these things and practice them we may some day reach the time when we will be to a great extent independent of the seasons, and will find the day, which Secretary Wilson imagines is already here, when we will have no crop failures.

The extent to which the wheat growers have learned that the buying of commercial nitrogen is needless is shown by the fact recently stated by a fertilizer manufacturer in Baltimore, which is the headquarters of the fertilizer trade, that over 80 per cent. of the fertilizers now sold there consist of phosphoric acid and potash without any nitrogen.

In a recent number of the *Ohio Farmer*, Dr. Thorne, the Director of the Ohio Experiment Station, sums up the consideration of the value of humus in the soil thus: "The humus of the soil is, therefore, the great storage battery of its elements of fertility, mineral as well as nitrogenous. It is in this store, chiefly or altogether, that our crops find their sustenance. When this store is exhausted they starve, and in proportion as it is reduced they suffer hunger. . . . Sand and clay are but the skeleton of the soil; humus is its life."

MR. NELSON: Is there no circulation of sap in the heartwood of a tree?

PROF. MASSEY: No, none at all. Hold on a moment, heartwood, as you know, lasts longer than sap. Decay starts in where there has been death. There has been no death in the heart, hence there is no decay, which starts in there, no blue mould as there is in sap wood. This dead matter lives on sap. It don't live on the heart.

MR. NELSON: I have an oak tree in my corn field, and I cut a groove around in it an inch deep on the fifth of May a year ago. I have done that several times and it is leaving out this spring and in blossom, just as nice as it ever did, and it will do that the next four years.

PROF. MASSEY: Well, it will die. I know that they will do that sometimes, but it will die.

QUESTION: While the southern farmer had poorer land by buying fertilizers was he not poorer financially?

PROF. MASSEY: Well, as I said, the southern farmer has been dependent upon growing cotton upon the same land year after year and I know of some land in North Carolina that has been in cotton seventy-five years in succession. The land has certainly gotten poorer not because of the fertilizer, but because the owner has been enabled to draw still further on the natural resources of the land. He puts a little on there, and the plant uses a little of that, and draws on the soil still further. It was really the lack of fertilizer, rather than the amount that he used; he has grown poorer financially because he has wasted his substance; he has wasted his bank account.

QUESTION: Please give an ideal short rotation for the Pennsylvania farmer engaged in general farming.

PROF. MASSEY: Now gentlemen, I do not like, as I said, to lay down rules for any particular man or particular section. We have certain rotations that have been found successful in various sections of the country. We have Mr. Cherry's rotation of potatoes and wheat and clover out in Ohio which has proved successful with him, but those farmers that I spoke of who are growing wheat so successfully on the eastern shore of Maryland have adopted a rotation of corn and wheat and clover. One man there who came out of the Confederate Army as poor as the rest of us started in there with nothing, went into a little business and got a little money ahead, and land was cheap in that section at that time. He engaged a man to farm for him on shares, and laid down the rotation, and the farm began to improve, and pretty soon he got money enough ahead to buy another farm, and there was a man ready to go on it on the same terms; that is, they would divide the cost of cultivating that farm as nearly as possible, and it was understood that all the roughage was to be used up on the farm, and the landlord take his pay in the manure, and the tenant soon found that it was a profitable business.

Year after year this man bought farms in that same neighborhood until this man McKinney died about a year ago, owning forty-two farms. His last wheat crop was 120,000 bushels, and men living near his farm are buying land and renting it out in the same way, and getting improved farms. That system of tenantry has been wonderfully successful there. Lawyers and business men are engaged in buying land, improving land and in renting it in the way I have mentioned. That system has been successful there. Their main money crop is wheat. Their object is to get as large a crop of wheat as possible, and then to manure their clover crop and put it in corn. They used to think, under the old system, that corn-land, was very poor for wheat; now they get the best wheat off of corn-land. I was in Maryland two years ago and had pointed out to me a twenty acre field from which a man had sold a thousand bushels of wheat, but that was the old land that had been cultivated since the early settlement of the country and only in recent years have they realized what that land could do in the way of wheat growing.

MR. RODGERS: Why will a tree not grow with the leaves all plucked off as they grow?

PROF. MASSEY: The leaves are the laboratory of the plant; they construct everything that tends to make growth, and without a laboratory for the plant, you can't get the growth, of course. There are some things like the evergreen tree, or the passion plant or like the cactus plant that act in the same way as leaves.

MR. J. W. COX: Can as good results be obtained by plowing manure under as applying it to the surface of the soil on a grass crop? Can the same value in plant food be obtained, or is there any loss in plant food by plowing the manure under? Will the plant food in manure, plowed under leach away beyond the reach of ordinary farm crops?

PROF. MASSEY: Well, I should say that would depend upon a great many conditions. We have found in certain experiments that manure spread in the fall on the surface and let lie there all winter—we have compared that manure plowed under at the same time, and other manure applied in the spring and plowed under when the whole was plowed, and we have found that that manure that was applied in the fall and let lie there on the surface all winter, gave the biggest crop of the three. That was one single experiment and made at the New Hampshire Experiment Station. Now one swallow don't make a summer, but as a rule I have found in the South—now climate and conditions differ—but as a rule I have found in the South the nearer you can keep the manure to the surface, the better, because it adds there a mulch and tends more to preserve the humidity of the soil. Therefore I believe that the best way to use manure is to keep it as near the top of the ground as possible.

MR. COX: How many pounds of nitrate of soda is necessary per acre for a top dressing of an old meadow, where the soil is in a fertile condition?

PROF. MASSEY: None at all, if the soil is in a fertile condition. The question assumes that the soil was not in a fertile condition; that it needs nitrate of soda. Nitrate of soda is a very good thing for some land for a grass crop, but as I have said, we ought to farm economically. It is necessary to produce an article so as to leave to the farmer the largest margin of profit without injuring his land. Some years ago a man down in South Carolina made 254 bushels of corn on an acre, and if he hadn't got a premium of \$500 from "The American Agriculturist" and \$500 from the State of South Carolina he would have lost money on it, so that the average good farmer wants to make good crops with the margin of profit on his side, and not to spend more than he receives in return as some millionaires do. Now I should apply—if I had special need for stimulating a crop of grass—I should apply about 100 pounds per acre of nitrate of soda. It is a very good thing, and in a great many cases it may be very profitable.

QUESTION: At what season of the crop would you apply this nitrate of soda?

PROF. MASSEY: I would never apply nitrate of soda except when the plant is in active growth and then would not apply it when it is moist from rain or dew.

QUESTION: Is it not well to apply the nitrate of soda early in the season?

PROF. MASSEY: Yes, you ought to apply it at the time of active growth, because otherwise you lose a great deal of it. It is washed away in the drainage water.

QUESTION: Is not nitrate of soda more beneficial by putting it on in a dry season?

PROF. MASSEY: No, I think not; if it is very dry, you must have moisture enough to dissolve whatever you put there, even so available an article as nitrate of soda. I do not think a dry season would increase its effect. Heavy rains might wash it away; there is no doubt about that.

QUESTION: How much commercial lime would you apply per acre?

PROF. MASSEY: That depends upon the kind of lime. Sometimes it is very strong in magnesium and not so good for some soils. Magnesium is a plant food, but we do not want too much of it. With good, pure lime, I think that 20 to 25 bushels is a plenty, if you are practicing a short rotation, and liming in about once in four to six years.

QUESTION: Would not the amount of lime that would be beneficial to the land depend very largely upon the kind of soil? For instance, a very heavy clay soil will respond well to a large application of lime than a looser soil will. Won't the amount of lime depend more upon the character of the soil than it does upon the quality of the lime itself?

PROF. MASSEY: It depends very largely upon the amount of organic matter in the soil, because some experiments seem to show that the reason why lime acts beneficially in the promotion of the nitrification of this organic matter, is, that these bacteria can get carbon from the calcium carbon which green plants can't do. Now whether that is exactly true or not, I am not prepared to say at present, but that their growth is promoted by the presence of an excess of lime in the soil, and that where then there is a great abundance of organic matter, lime is more apt to give good results, than where there is but little.

MR. RODGERS: Would the beginning of May—the first two or three weeks in May be too late?

PROF. MASSEY: That would depend very much upon the locality.

QUESTION: Do you think that clover failures are due as much to a poor, mechanical condition of the soil, that is the lack of humus, as to any other cause?

PROF. MASSEY: I think, as I said, it is probably due to the deficiency of humus in the soil, as well as to acid conditions.

QUESTION: How much lime should be applied to insure a good growth of alfalfa on a medium heavy clay soil on which clover can be grown with a fair degree of success?

PROF. MASSEY: I think the same amount would do very well for clover or alfalfa, and alfalfa particularly needs lime. I never succeeded with it without lime.

MR. GLOVER: When second-crop clover is not filled with seed which is better to cut for hay and feed stock at no great profit or leave on the land to be plowed down the following spring for corn, taking the question of labor saved into account?

PROF. MASSEY: I think for most farmers where that second crop cannot be used profitably for feeding he had better leave it where it is and take the profit in the corn the next year and in the seeding of the land for clover when it is broken again.

QUESTION: In regard to saving for seed. If clover is hulled and the hulling spread over a field, will it give about the same benefit as it would if it was left uncut?

PROF. MASSEY: O yes, I think so. You know the need for germination, moisture, and the presence of oxygen, and if any of these are absent, the seed is not going to grow.

MR. GLOVER: Is an application of 40 bushels of lime to a soil, fairly well supplied with humus, every twelve years using too much lime where a four year rotation is practiced?

PROF. MASSEY: No, it is not using too much lime, but putting too long a time between applications. They better use half as much and use it twice as frequently.

QUESTION: What is the best legume rotation for the general farmer?

PROF. MASSEY: I am going to leave the farmer to work that out for himself.

QUESTION: How may the thinking faculty be better developed in a shallow mind?

PROF. MASSEY: Well, by the use of any faculty, we can certainly improve it. If a man will put himself to reading and thinking, he can certainly improve his thinking faculties.

QUESTION: Why do crops thrive near locust trees and not near walnuts?

PROF. MASSEY: Locust trees are legumes.

QUESTION: Nitrate of soda and potash salts have a tendency to draw moisture from the air. Is it probable that the benefits derived from their use is in a measure attributable to the water supplied as to their chemical constituents?

PROF. MASSEY: I think that the matter of moisture from the air would have very little to do with the effect of these chemicals; you have got to get a larger amount of moisture by a good deal than would come from that source.

QUESTION: Please repeat that statement in reference to the use of lime on alkaline soils, etc.

PROF. MASSEY: I did not speak of using lime on soils already alkaline; I spoke of restoring feeble alkalinity in soils which is favorable to clover.

QUESTION: Is it not true that early fruiting in fruit trees, shortens the lives of the trees, the same law holding true in animal life? If so, isn't it a question if trees should be thrown into early fruiting, especially a fine tree?

PROF. MASSEY: Well, that is a matter for a man to consider in regard to the profits which he is seeking to get out of a tree; whether he is going to profit for a few years or for many years. There are some varieties of trees that are early bearers and usually short-lived trees. The longest lived apple trees are a great many years coming into fruiting.

QUESTION: Many farmers take all bark off of the trunks of old trees, claiming that it produces fruit. Why do these trees not die? Does not the sap run between the cambium and bark?

PROF. MASSEY: Well, the new growth, if you take it at a certain time of the year, if you are careful not to too much interfere with what is called a cambium layer or the younger cells and bark that exert the drawing influence on the air, it may be done, but it is a serious check, however, to the tree; it may throw a very rapidly growing tree into fruiting, but I think there are other methods that might be used which are safer. You may make a mistake and kill the tree.

QUESTION: Would you use cow peas instead of clover when you can grow either? Which should have the preference?

PROF. MASSEY: I should use cow peas to put in as a catch crop in any place that I had for them vacant. I should depend upon clover as a regular thing, all the time.

MR. SEEDS: What variety of seeds should you use?

PROF. MASSEY: It depends upon where you live; whippoorwill is good for the average conditions in Pennsylvania.

MR. SEEDS: Which would be the best in a short season?

PROF. MASSEY: The New Era and Warren's Extra Early; they are both seeds that will ripen in sixty days. Wherever you find that you have ninety days of warm weather, the Whippoorwill will do very well.

QUESTION: Is it too late to sow them now?

PROF. MASSEY: No, in North Carolina I sowed anywhere from the latter part of May to the middle of August; here you can sow from the middle of June up to July, I should say.

QUESTION: Would these be very much superior to the Canada field pea?

PROF. MASSEY: Oh yes, we have tried the Canada field pea in the South; it is certainly unsuited to climate conditions there.

QUESTION: Where can I get the New Era cow pea?

PROF. MASSEY: You can get it in Philadelphia; I don't know whether my friend Moore has it or not. You can get it of Mr. C. W. Wood & Sons, of Richmond, Va., I know.

MR. BEARDSLEE: Will it flourish well in the northern half of Pennsylvania?

PROF. MASSEY: Except on special soils, I very much doubt it. If you get a warm sandy soil, it might. Now I had a photograph sent me the other day of a very successful field of cow peas grown in Wisconsin. I met a lady dairyman in southern Vermont who said she couldn't get along without it.

MR. HALLOWELL: Is green rye to height of three feet advisable to plow down in order to increase fertility? Or, shall I take off same after-blossom and apply commercial fertilizer to produce corn for silo filling?

PROF. MASSEY: I would plow the rye under for a cultivated crop. Now in the South we have found that it never does to plow under a green crop in hot weather. In the spring of the year we can plow under there a green crop for a cultivated crop like corn very successfully.

QUESTION: What time of the year and to what crop do you apply lime to correct soil acidity? How many bushels per acre do you apply?

PROF. MASSEY: Apply it to the corn crop which they are going to follow with wheat and clover. Ordinarily if my land was adapted to give me a good stand of clover, I would try it on clover the second spring.

QUESTION: Do you recommend feeding this to stock?

PROF. MASSEY: Ordinarily, I would turn it down, I think.

QUESTION: Where we do not have the humus had we not better use the acid phosphate and apply lime?

PROF. MASSEY: Yes, I suppose you had better apply the dissolved rock in that case; but if you will use it with your stable manure and abandon all this pulverized float, it will become very available, and not only that, but it will save manure to a great extent.

QUESTION: The Pennsylvania valleys are usually covered with a deep, clayey, loamy or shaly soil, the hillsides the same but shallower, but under all we have no end of raw soil-making material. We use the short rotation and fill the soil with vegetable matter. Would you advise the use of lime, and how much to the acre?

PROF. MASSEY: I did talk about that; I would use lime in regular rotation.

QUESTION: When there is no trouble to get clover, do you believe it good to practice a two-year rotation, that is clover every other year?

PROF. MASSEY: No. I would make it a little longer; say three or four years.

QUESTION: In a three-year rotation of wheat, clover and potatoes, will the potato crop be benefited more by applying commercial fertilizer after harvesting the clover than by applying when planting the potatoes, the second crop of clover being left on the ground and plowed under in spring?

PROF. MASSEY: I would apply all the fertilizer to the potato crop.

MR. CAMPBELL: Why is it that fertilizer manufacturers are asking almost as high prices for floats as for the acid phosphate?

PROF. MASSEY: Because a trust controls the whole thing.

MR. C. O. MATTERN: What variety of cow peas would you advise this far north?

PROF. MASSEY: I have just stated that.

MR. MILLER: Where we lime every third year (lightly) is there any danger of acidity?

PROF. MASSEY: No, I don't think that is really advisable. I would not lime more frequently than once in four to six years.

MR. MILLER: Would you sow all clover as the third or fourth year rotation?

PROF. MASSEY: In my experience, I would prefer all clover.

QUESTION: Can a repellant be introduced into the circulation of a tree to prevent insect injury to the foliage or fruit?

PROF. MASSEY: I know of none at all.

MR. HOOVER: What formula of commercial fertilizer is best adapted for the tobacco plant?

PROF. MASSEY: Commercial fertilizer which should contain at least ten per cent. of potash in the form of hydrosulphate, not in the form of muriate. The nitrogen is best obtained by a small portion of nitrate of soda to start the crop and dried blood is the main source of organic matter; acid phosphate would cause the tobacco to be bony.

QUESTION: Is it best to plow down the full-grown crop of scarlet clover, or first to make the crop into hay and then plow the field for corn or other crops?

PROF. MASSEY: It depends upon whether a man can feed it profitably or not. I think as a rule it is harder to cure than any other clover, in my experience, and I would generally plow it under.

QUESTION: How would you thicken an alfalfa plot?

PROF. MASSEY: By harrowing it over and sowing in some more seed.

QUESTION: What price should we be able to get float for per ton?

PROF. MASSEY: About seven dollars and a half.

QUESTION: In a corn, clover and grain rotation, will you give more of the details of the sowing and harvesting of these different crops?

PROF. MASSEY: Well, take "The Practical Farmer."

MR. HUTCHISON: Mr. Chairman: We are to have to-night a memorial address by Mrs. Wallace, and I move that an invitation be extended to Prof. Massey to deliver a talk of ten minutes and to Joel Herr, after Mrs. Wallace delivers her address.

The motion was duly seconded.

DEPUTY SECRETARY MARTIN: Mr. Chairman, kindly let Mr. Nelson make a statement which may give more light upon the matters involved in this motion.

MR. NELSON: Mr. Chairman, I have been asked to invite the visiting comrades who are here to remain at the Memorial Service which will take place this afternoon. I understand that the address of Mrs. Wallace will come immediately after the services which are to be held here.

The **DEPUTY SECRETARY:** Mr. Chairman, I would just briefly state that this Memorial Service is of a greater importance and appeals more directly to our hearts and feelings than any other service or any other holiday in the United States, and we gladly join with the Grand Army of the Republic in this service, and yield a portion of the afternoon's program for that purpose, and if it is agreeable to the Grand Army and their portion of the program, we will join and have Mrs. Wallace follow with her address which is given on the program for this evening, and then the motion of Mr. Hutchison that the veterans who belong to this convention, be invited to take part in the program in the Memorial Service for this afternoon, and then after the services are concluded, if time will permit, we will take up the round-up section, devoted to the matter of local institute management.

We probably will have finished this service about two o'clock or thereabouts. I make this suggestion in order that we may all join

together in this, one of the most sacred days of the year for those who love this great country of ours.

MR. HUTCHISON: Mr. Chairman, I will withdraw my motion in regard to this evening, but I would renew it so that the gentlemen named may speak this afternoon. I think it will be very fitting to have the Blue and the Gray join in the services, and therefore I make that motion.

The question being on the motion, it was agreed to.

The Chairman announced that the Memorial Service would take place at one o'clock.

On motion, duly seconded, the meeting adjourned until one o'clock P. M.

MEMORIAL SESSION.

Clearfield, Pa., Court House, 1 P. M.,
Wednesday, May 30, 1906.

At the hour designated the Memorial Service was conducted under the auspices of Post 179, G. A. R., of Clearfield, Pa. The order of exercises was as follows:

Singing by Quartette.
Prayer by the Rev. Mr. Miller.
Singing by Quartette.
Introduction of Orator by Chairman.
Oration by Rev. Mr. Enders.
Singing by Quartette.
Address of Prof. Massey.
Address by Mrs. Wallace.
Address by the Hon. Joel Herr.
Closing Song, America, by Audience.
Closing Prayer, by Rev. Mr. Reily.
Distribution of Flowers to Veterans.

Mrs. Wallace, as per program, delivered the following address:

MEMORIAL DAY.

By MRS. MARY A. WALLACE, *Ellwood City, Pa.*

Mr. Chairman, Comrades, Ladies and Gentlemen: As many are gathered here from almost every section of the State, attending the Farmers' Normal Institute on this Memorial Day, it is fitting that we should specially remember the soldier dead of Pennsylvania. But friends, you cannot honor these dead of ours. They have passed beyond our reach. History hath claimed them for her very own. Upon the broad facade of the Republic, their names are

indelibly inscribed. Grandly they responded to their country's call, "to arms," and nobly did they do their duty as soldiers. Wherever there was need of the bravest, there were the Pennsylvania volunteers, and when the high tide of the Rebellion threatened to engulf this old Keystone State, it was one of her sons who led the forces of resistance, that turned it backward and saved the Union—Meade, Gettysburg.

Gettysburg! Gettysburg! Pennsylvania is proud of thee, the nation's most hallowed shrine before which she bows her head in reverence and honor to-day.

The graves of many of these dead of ours, are kept green in our National Cemeteries. Thousands are resting in the quiet churchyards and cemeteries throughout the land, while still other thousands sleep where they fell by mount, and stream and sea, the place of their sepulture, unknown to all save God and His angels.

But whether they lie beneath the ocean's wave, or in the dismal swamp, beneath Southern palms or Northern pines; in the dark ravine or on the mountain top, a grateful nation pays its tribute of devotion to their loyalty to-day.

May we not hope, friends, that in that land where there is no war, where the sun of peace sets, that there is to-day a grand rendezvous, a grand rally of all the soldier dead who have borne arms in the defense of our country here on earth, and that they can see and know and are rejoicing in the prosperity that hath blessed the land for which they suffered so much. And may we not hope, too, that the men in Gray who met the men in Blue with bayonet and bullet on the many gory battle-fields, are with them, are rejoicing with them, and, figuratively speaking, drinking with them from the same canteen.

Comrades of the Grand Army, as memory slowly fills up the lines in your furrowed faces and obliterates the gray hairs on your heads, we recognize you as the "boys of '61," who, in the full vigor of early manhood, when face and form were aglow with the fire of youth, went forth so grandly with the Comrades whose graves we decorate to-day to battle for your country.

Each year your skeleton ranks are being reduced still more by the details ordered to join the forces beyond the river, but to you who still remain in camp on this side, I will speak a word of encouragement. When you have listened to the solemn sound of taps for the last time, when the reveille shall waken you no more, and you have turned in for that long, dreamless sleep that comes to each of us, may it comfort you to know that so long as the Stars and Stripes shall kiss the freeborn breeze, so long shall your deeds be spoken, so long shall your names be carved in the historic marble of your State and Nation, so long shall your descendants and all citizens in whom you have by your example kindled the fire of your unquenchable patriotism, assemble on each recurring Memorial Day to recount your struggles and to place a flower upon the soil that shelters a soldier's bivouac.

And now friends, in closing, I would say that although Memorial Day is a day dedicated to the memory of our soldier dead, it should also be a day of introspection by every citizen.

There have been other republics, great and grand and strong, but where are they to-day? Where is Greece, that mother of re-

publics, whose hills were the birthplace of freedom? Greece, that in the centuries of her existence as a republic had risen to the highest plane of learning, art, science and literature. Nothing remains of that once powerful republic except the imperishable thought that has come down to us from her poets, her philosophers, her statesmen, her sages, and through which those brainy old Greeks are today in this twentieth century the

"Sceptered sovereigns that rule our spirits from their urns."

And Rome, great and mighty Rome, what of her? Rome whose transformation from a republic into an empire, was one of the greatest crises in human events. Her history is recorded under the heading of "Republics that have been." Is it possible that the record of those republics is to be the record of the republic of the United States of America? Aye, friends, it is possible, but let us hope not probable, and that our old ship of State may take warning, and avoid the rocks upon which they were wrecked.

One of these, to which was largely due the downfall of Rome, was what in these days would be termed her "territorial expansion." As Rome grew older she became ambitious to rule the world, and began reaching out after this kingdom and that kingdom, until in the end, it might be truly said that she fell by her own weight. Rome learned too late that the difficulty in maintaining a republican government is largely in proportion to the extent of the area over which it is established.

Another cause for the downfall of these great republics, was the decay of those peculiar virtues so necessary in upholding a popular form of government. Patriotism and love of country, so dominant in the older Greeks and Romans, became swallowed up by the gross vices of lust for power, wealth, pleasure and personal ambition, and for years before the end they were only Republics in name, in reality an aristocracy of wealth, luxury and pride. Social and political corruption ran riot while the rich became immensely rich and the poor desperately poor.

And so I say, friends, that in these days of greed and graft, when great corporations are demonstrating most forcibly that they have no souls, when millionaires are made in a night, when the wealth of the land is being centered in the hands of a few, when fathers and mothers will barter away their daughters to some scion of royalty for his title, thus showing the aristocratic tendency of the times, it is important that we stop and think; that every citizen should, on this Memorial Day, ask himself the question, allowing his conscience to answer him truly, whether or not he is living up to the high ideals of true citizenship, and the words of the immortal Lincoln, "from these honored dead take increased devotion to the cause for which they gave the last full measure of devotion, and highly resolve that these dead shall not have died in vain; that the nation shall, under God, have a new birth of freedom, and that a government of the people, by the people and for the people shall not perish from the earth."

And now to our soldier dead, farewell! To our soldier living all hail!

Professor Massey was next introduced, and coming as a native of the South, and having fought in the Confederate army in the great conflict, added interest to his remarks.

He said people talked about the New South. It was the Old South in reality represented by the younger men. While it was true that he was a representative of "The Lost Cause," he said he thanked God that the cause was lost. It was a blessing to the South; the whites were emancipated as well as the blacks. They never knew until they were taught by experience after the war, the stuff that was in them. To-day they stand by the flag as loyally as their northern brothers.

The Hon. J. A. Herr, a veteran, and member of the State Board of Agriculture, also made appropriate remarks along the same line. After the exercises of the meeting were concluded, a parade was formed and marched to the Cemetery.

Meeting adjourned to 7.30 P. M.

Court House, Clearfield, Pa., 7.30 P. M.,
Wednesday, May 30, 1906.

The Institute assembled and was called to order at the designated hour by Mr. T. E. Orr, Chairman.

MR. ORR: The first topic to be taken up this evening is "The Breeding of Poultry for Egg Production; Housing, Care and Management," (illustrated by lantern slides,) by Prof. James E. Rice, in charge of Poultry Husbandry, Cornell University, Ithaca, N. Y. It gives me great pleasure to introduce to this audience Prof. Rice, of Cornell University, as the lecturer of the evening, and I want to say to you that Prof. Rice has done more for the poultry interests of this country than any other man, or any other five living men. I have seen the work he has been doing for ten years, and I want to say that the work he is doing in his position at Cornell University at Ithaca, where he has occupied and still occupies the position of Professor of Poultry Husbandry, has been of the very greatest value; and now without extending these remarks, I will say that it is a privilege and a pleasure to introduce to you to-night, Professor Rice, and I hope you will join in giving him a hearty greeting.

Prof. Rice addressed the audience as follows, illustrating his talk by lantern slides of a very interesting character, showing the latest methods of poultry raising in various parts of the country:

SOME POULTRY PROBLEMS.

By JAMES E. RICE, Assistant Prof. of Poultry Husbandry in Cornell University, Ithaca, N. Y.

Ladies and Gentlemen of the Institute: It is a special pleasure to attend this meeting. First, because it is on one of the largest poultry states in the Union, ranking among the first six in importance and value of its poultry and poultry products. Second, because I have long desired to know more about the institute workers of Pennsylvania whom I have read about and learned so much about

through our mutual friends, T. E. Orr and Alva Agee. Third, because I wish to reciprocate in some measure the good which Mr. Orr has done for the State of New York through his many practical lectures at our poultry and farmers' institutes.

Poultry husbandry is just coming to its own. The people, now, as never before, are beginning to realize the great extent and the importance of poultry keeping. They realize that almost every farmer and many village people are interested in poultry, and therefore poultry bulletins and other literature issued from our agricultural colleges and experiment stations is one of the easiest and most effective ways of reaching the people. Notwithstanding the importance of poultry husbandry from an educational, as well as an economic stand-point, only three or four states in the Union are giving it any special recognition as a subject for instruction or investigation. The few efforts which have been made to establish poultry departments in the experiment stations and agricultural colleges, are meeting with such marked approval on the part of students and poultrymen generally, that a large number of states are now considering seriously the advisability of establishing poultry departments as strong and effective as any of the other departments of the college or the experiment station. They are wise in this decision. No money that is appropriated by the State is expended more wisely than that which is devoted to the education of the farmer in the methods which will enable him to produce better products to feed the world, and to do so most economically and effectively. One cent saved on each dozen of eggs produced in the State of Pennsylvania, one more chicken raised on each farm in the State, one dozen more eggs produced each year by each hen in the State, would produce a product so great that none of us would have guessed its value. Nevertheless, such are the possibilities to be brought about in this and in every state through investigations and by instruction at the Agricultural College, the Farmers' Institutes, the Reading Courses, etc. Indeed, such a result is taking place in several states. It is imperative that each state undertakes this work in order to keep up with the race and sharp competition for the markets of the world. The poultrymen in the State which does not encourage and help them cannot win out in competition with the states where they have up-to-date poultry schools and an experiment station where the interests of poultrymen are given a proper share of attention.

My purpose, however, in speaking to you this evening, is to discuss some of the important problems confronting poultrymen and to illustrate by lantern slides some of the things which it is difficult to express in words. The field is so large and the time so limited that it is impossible, in the short space of an hour, to touch upon many topics.

One of the most important poultry problems is, how to maintain and increase the vigor of the flock. Constitutional vigor plays an important part in the production of large numbers of eggs, of fertile eggs, of hatchable eggs, and of chickens which rather live than die. How best to breed, feed, raise, and house poultry so that each year the flock will be more hearty and vigorous than before, is the question around which all of our investigations at Cornell University, center. One of the principal factors which has contributed toward lower vitality in the flocks of the country, is the improper construc-



FIG. 1.

as far as possible, fences. Fig. 4 is a view of a Westchester county fruit and poultry farm where 1,500 White Leghorns are kept for egg production. These are divided, approximately, into three flocks of from four to six hundred each. These flocks are separated from each other by six foot wire fences and each is given two or three acres of orchard for range. The orchard furnishes shade, the intervals between the trees permits growth of grass for green food, and the fowls in return, furnish fertility to grow larger trees and better fruit. On this farm the fowls were originally fenced off into small flocks of 25 to 30 each, which made a tremendous outlay for fences and made it well nigh impossible to spray the trees effectively, the spray mixture quickly ruined the fences. Gradually these fences were taken out and it was found that all the various flocks returned to their own separate pens. It is well to remember that the biggest bump in a hen's head is the bump of location. Compare by contrast the expense of the yards, restricted runs, extra labor, and the lack of shade in the poultry plant shown in Fig. 5.

The problem which concerns all who operate incubators, is a proper temperature at which to operate the machines. We have tried a large number of experiments with the object in view of determining the best temperature to run the machines during each week of the hatch. We early discovered, that, in order to know the temperature which the eggs were receiving in a given machine, we must first decide how the thermometer should be placed. With this object in view, we ran a large number of hatches with different incubators, each of which contained three thermometers of different types. One was suspended with the bulb slightly above the surface of the eggs. One was placed with the bulb resting on fertile eggs. The other was placed on the tray with the bulb between the eggs. (See Fig. 6.) In each case these thermometers were placed precisely according to the instructions of the manufacturer. The actual result as shown by the reading of these thermometers during the entire hatch was startling, see Fig. 7, which is a reproduction of one of the incubator records which we keep when we operate each and all of our machines. The top line represents the temperature reading of the hanging thermometer, the middle line the thermometer resting on the eggs, the bottom line the thermometer that was between the eggs. It will readily be seen that there was a net difference between the reading of the hanging thermometer and the thermometer between the eggs of three to four degrees during the first two weeks of incubation which was gradually reduced during the last week. It will readily be seen also that if a given machine were to be run at 103 degrees by the hanging thermometer, the reading of the thermometer between the eggs would be 99 to 100 degrees. If, on the other hand, we were operating the incubator by the thermometer between the eggs at 103 degrees, the hanging thermometer would be running at 106 or 107 degrees. We have not yet determined just what temperature a machine should be run with each of these thermometers, but we have demonstrated that with certain machines the hanging thermometer did not give sufficient heat to get the chickens out until the 22nd or 23rd day, and some of them not at all, particularly where the eggs were cooled to any extent. We found, on the other hand, that where the temperature was run at 103 with the thermometer between the eggs, nearly

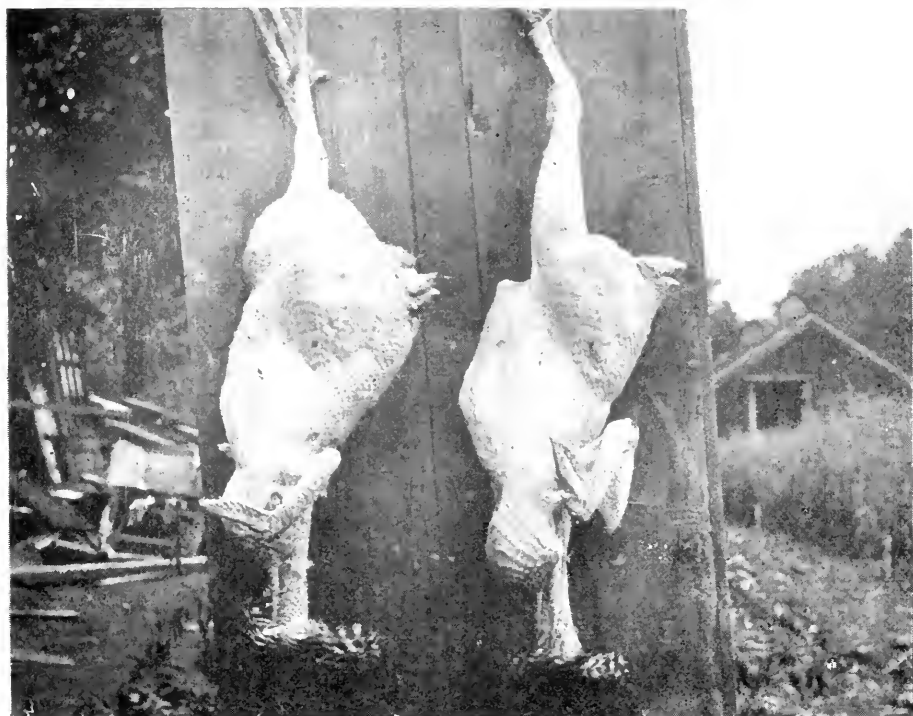


Fig. 3.



Fig. 4.

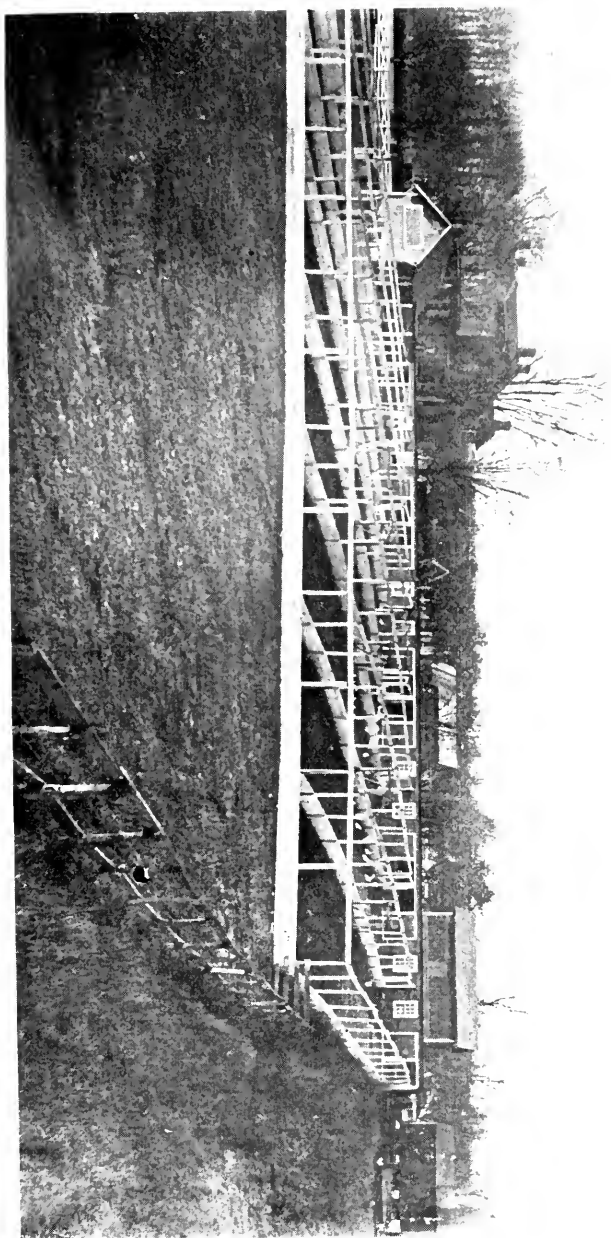


Fig. 5.



Fig. 6

CORNELL UNIVERSITY—COLLEGE OF AGRICULTURE
CO-OPERATIVE POULTRY EXPERIMENTS

Incubator

Various

INCUBATOR RECORD.

Operator

Eggs		Date of 1st Test		Date of and Test		Date 1st Chicks Hatched		Date Through Hatching		Date Through Hatching	
Day	Date	Hour	Position of Thermometer	Position of Regulator	Chamber of Moisture	Temperature of Room	Temperature of Eggs	Position of Eggs	Wet Eggs Turned	Wet Eggs Cooled	Wet Eggs Cooled
1	July 25	5:25 AM	Horizontal	Up	Room	77.5	77.5	10	10	10	10
2	"	4:17 PM	"	"	"	77.5	77.5	10	10	10	10
3	"	7:40 AM	"	"	"	77.5	77.5	10	10	10	10
4	"	7:40 AM	"	"	"	77.5	77.5	10	10	10	10
5	"	5:00 PM	"	"	"	77.5	77.5	10	10	10	10
6	"	10:00 AM	"	"	"	77.5	77.5	10	10	10	10
7	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
8	"	4:30 PM	"	"	"	77.5	77.5	10	10	10	10
9	"	10:00 AM	"	"	"	77.5	77.5	10	10	10	10
10	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
11	"	5:00 PM	"	"	"	77.5	77.5	10	10	10	10
12	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
13	"	4:30 PM	"	"	"	77.5	77.5	10	10	10	10
14	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
15	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
16	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
17	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
18	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
19	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
20	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
21	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
22	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
23	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
24	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
25	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
26	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
27	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
28	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
29	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10
30	"	11:00 AM	"	"	"	77.5	77.5	10	10	10	10

Fig. 7.

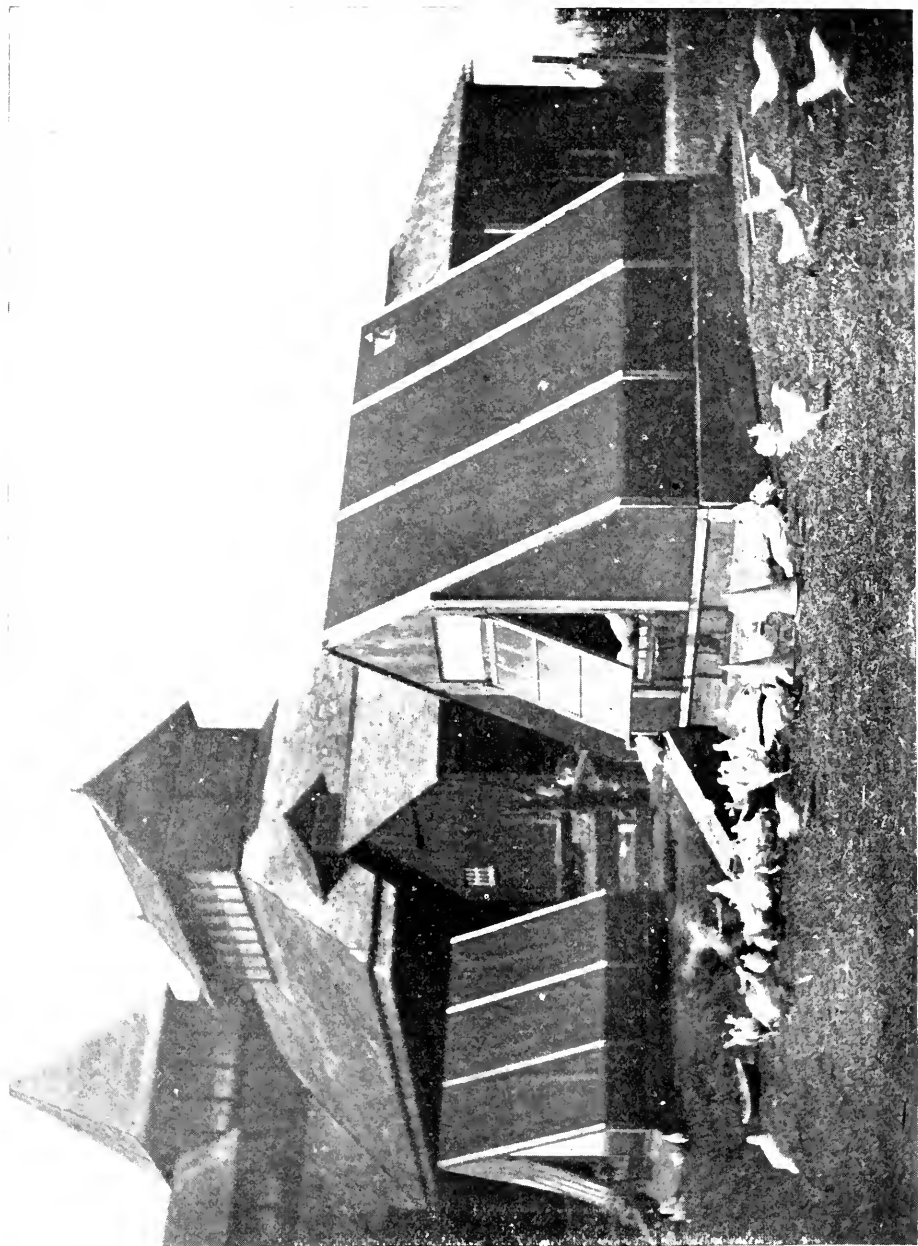


Fig. 8.

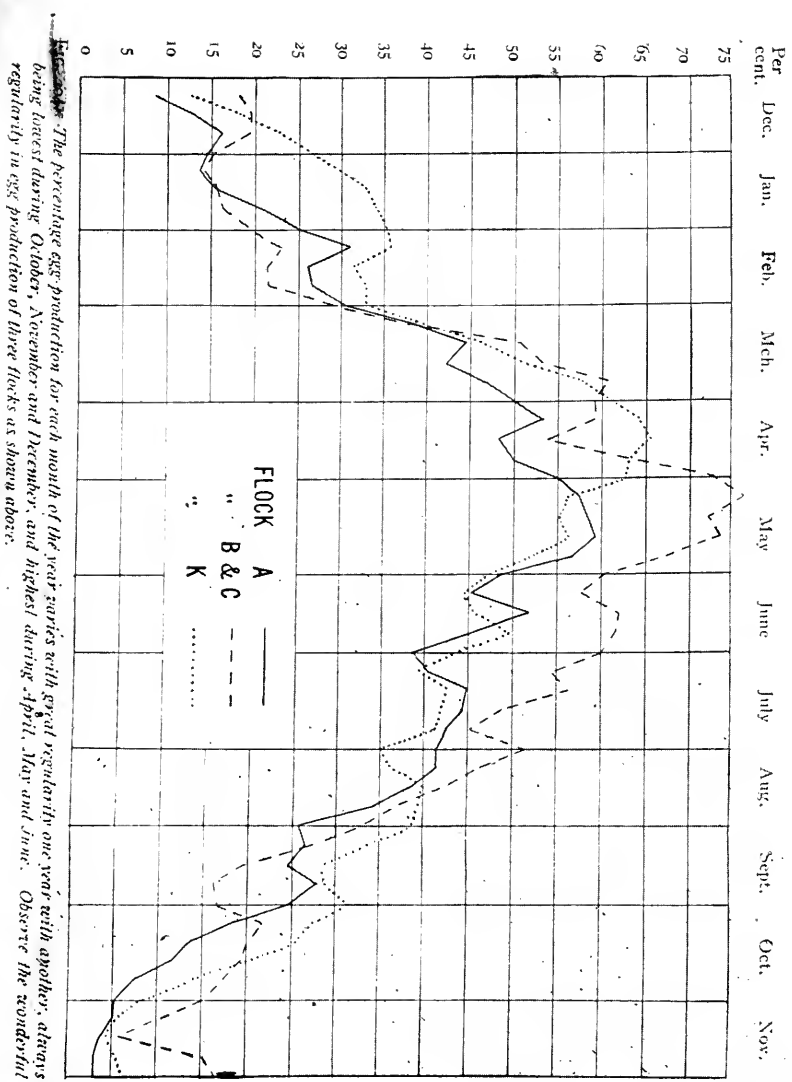


Fig. 9.

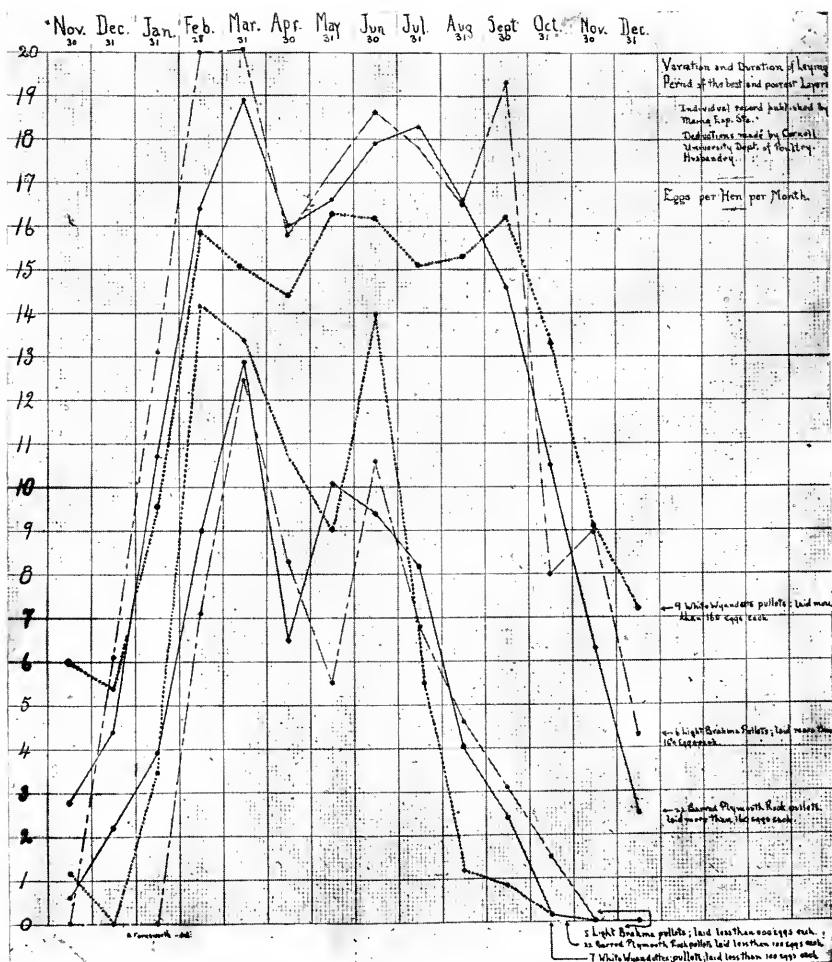


Fig. 10.

all of the chickens were killed during the first or second week of incubation, due to excessive heat, particularly where little cooling was given. We anticipate publishing a bulletin, in the near future, giving the results of our investigation as soon as we can make positive recommendations.

Of equal importance to the successful hatching of chickens is the method of brooding. There are four ways of brooding chickens. 1st, long house, with hot water pipes which is particularly intended for rearing chickens during the winter. 2nd, the out-door brooder holding 50 to 100 chickens, intended primarily for the smaller poultry farms. 3rd, the long house heated with individual in-door brooders which is a combination of the first and second types and has the advantage of saving labor, but has the disadvantage of serious loss by fire, and the difficulty of keeping the air pure. A fourth type, which in my opinion, is very much to be preferred, except, possibly, for winter broilers, is the colony house with an in-door brooder. (See Fig. 8.) The advantages of this system are that the houses are portable and can therefore be moved with ease from place to place in order to give chickens fresh ground and larger range. For instance, they can be grouped close to the buildings during early spring where they can be easily cared for and moved to the meadows, pastures, orchards, and corn fields later in the season. If these houses are built, as they should be, 8 feet square, they are large enough to be used the year around so that there is no idle capital invested. Such a house will accommodate fifteen fowls for egg production during the winter which makes a nice breeding pen. The house shown in the illustration is one which we designed at Cornell University, with the double object in view of the greatest economy of material with sufficient head room to do the work conveniently. It is built on runners, one foot high, which form the sills on two sides. This idea we got from Brother Orr and are very much pleased with it. The advantage being that the chickens have the benefit of a cool, shady place during hot weather and a quick retreat from the hawks. A point of no little importance is, that rats and other vermin cannot use it as a breeding and hiding place as they do with all types of brooder and colony houses which are close to the ground. This particular type of house, shown in the illustration, we heat with gasoline heaters especially designed for the purpose. Gasoline has two decided advantages over kerosene. First, it furnishes a much higher heat so that we can keep 200 chickens in a flock without crowding instead of 50. We therefore save about three-quarters the labor of feeding, watering and caring for the chickens. Second, the five gallon tank of gasoline, which is stored in the peak of the building, does not need to be refilled more than once in two or three weeks, depending upon the weather. There being no wick to trim, the heat system therefore requires scarcely any attention from one week to another. You will observe that the house is provided with both cloth and glass in front. The glass window furnishes warmth and sunshine necessary to the health and dryness and the cloth gives ventilation. Bulletins will be issued during the year, from the experiment station, giving details as to the construction of these houses and system of heating which will be free to all who apply for them.

The four slides which follow are the results of an effort to solve and show graphically some of the laws governing egg production.

Fig. 9 represents by plotted curves the percentage egg production of three large flocks of Leghorns on largely separate farms in the State of New York. Observe how closely the lines follow each other during each month of the year. Through this we deduct the law that egg production is governed by climatic conditions which has to do not only with the temperature, but the length of day and the amount of sunshine. The lowest per cent. productions, it will be seen, are in the months of October, November, December and January, the months of lowest temperature, shortest days, and least sunshine. The months of highest percentage production are April, May and June, months most favorable for egg production. The total height of these curves can be raised by increasing the per cent. of egg production through the use of early hatched pullets and by using pullets rather than hens.

Fig. 10 shows the variation in egg production for a year and two months between three flocks of poor layers which laid less than 100 eggs each a year. This flock consisted of 5 Light Brahma pullets, shown by the dash line, 22 Barred Plymouth Rocks, the solid line, and 7 White Wyandottes, the dotted line. The upper three lines represent the variation in egg production each month of 9 White Wyandottes, 6 Light Brahmas, and 22 Barred Plymouth Rock pullets, each of which laid over 160 eggs per year. You will observe that the hens which laid the least eggs did not begin to lay until January and February, whereas, the others were laying well in November and December. The poorer hens never reached a production of over 13 to 14 eggs per month per hen, whereas, the others continued for the entire spring, summer and fall, with a record of over 16 to 20 eggs per hen per month. You will see, also that the poorer hens got tired of their job and ceased business entirely the following October, while the better hens continued to lay from three to seven eggs a month during November and December.

A problem much discussed among poultrymen is, how long to keep fowls for profitable egg production. Fig. 11 shows graphical plotted curves of percentage production of certain flocks of hens through two full years of laying, as in the previous chart the production of three breeds are considered. It is worthy of note that they follow pretty closely, the same general trend of productivity of each month. Observe how much higher the curve of percentage production is with the pullets than it is with the hens. Especially compare September and October at the end of the first year with the same months at the end of their second year. These hens were all trap-nested as a means of determining the best from the poorest layers. It is also interesting to learn whether or not it is possible to select in any other ways than by trap nest, fowls which are to be the best producers. One of the ways in which we may judge of the fowls future productiveness, is by its early maturity and precocity. Occasionally this law is interfered with from the fact that too early maturity, while it indicates possibilities of productiveness, so weakens the fowl that it fails to meet its possibilities and our expectations because of exhausted vitality.

Fig. 12 is an effort to show actual results in percentage production of three flocks of pullets which began to lay first, and three flocks of the same variety and of similar age which were latest to begin to lay. The solid line represents those which laid first with

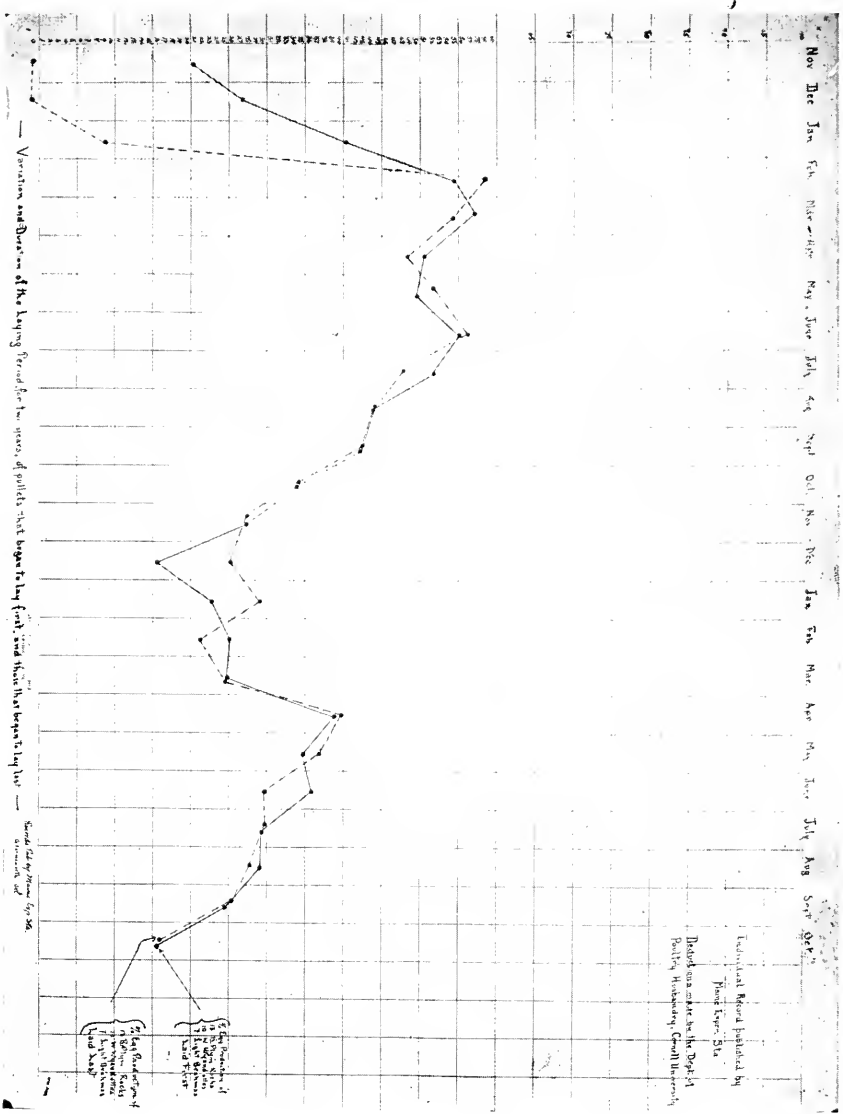


FIG. 11

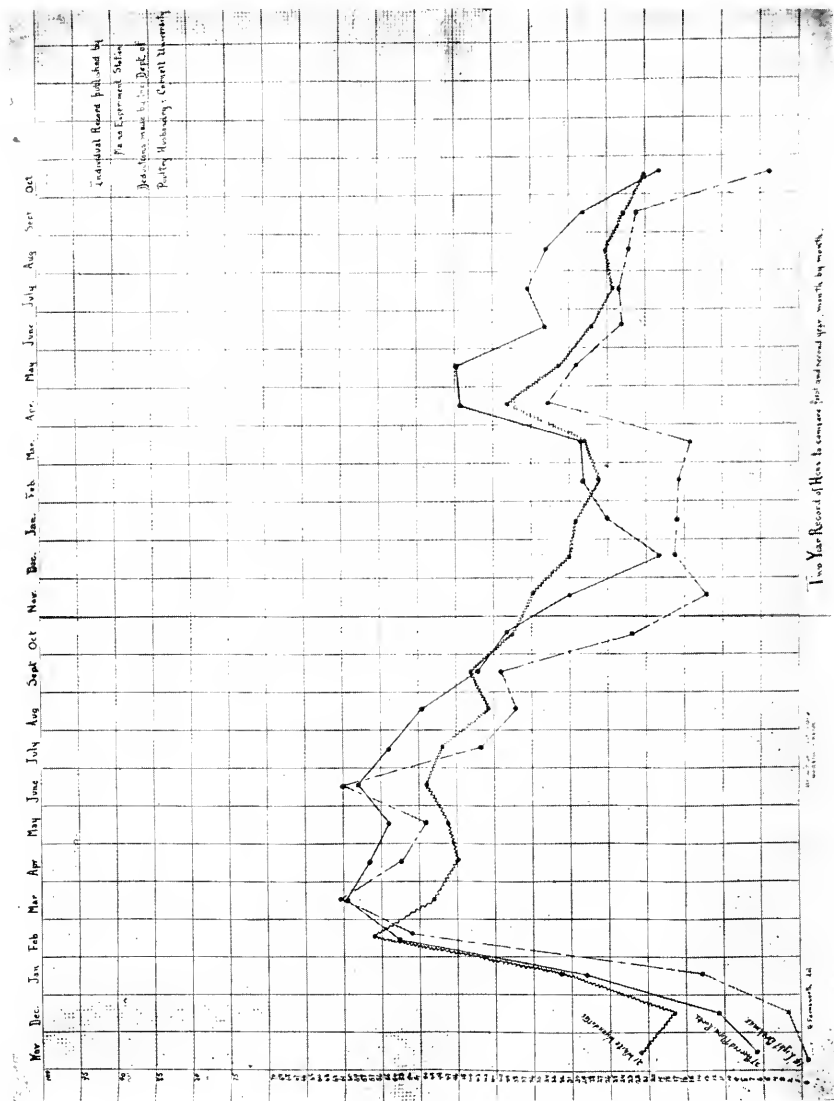


Fig. 12.

the record of from 20 to 28 per cent. production for the months of November and December, and 40 per cent. for January, whereas, the slowest to mature laid no eggs during November and December and only 9 per cent. during January. From that time on, for two years, they laid the same percentage, but those which began to lay last never overcame the handicap of the three months of their tardiness, November, December and January. Calculations and the deductions drawn as shown by the plotted curves were made by the writer from data found in bulletins published by the Maine State Experiment Station, giving the trap nest records for several years of a large number of hens.

Of equal importance to the production of good poultry and eggs is the problem of marketing the products at high prices. Good eggs and poultry are worthy of neat, attractive packages. Aside from producing good eggs, it is the easiest and most effective way to convince consumers that your product is better than the other fellow's. Appearances count for much in the selling of any article for human consumption. A well made, attractive, properly stenciled crate not only enables a person to charge a higher price because of attractiveness, but also insures the safe return of packages when shipped by express, due to the fact that they are not so likely to be overlooked and thrown off at the wrong station, also because they are so conspicuous that they are not likely to be taken by other shippers intentionally or through error.

The last two slides to be shown illustrate a piece of investigation which one of the students in poultry husbandry at Cornell has been doing the past year. To find out the difference in type of the different breeds of poultry particularly with a view of determining characteristic qualities for economical meat production, he photographed alive, dressed, and dissected, a large number of fowls of six different breeds, took accurate measurements and weights of the different joints, muscles, internal organs, etc. In addition to this, he made cross sections and longitudinal sections of various muscles from the different varieties studied. For the purpose of illustration, it will be sufficient for us to compare, by contrast, two of the principle breeds which he examined.

Fig. 13 shows the Barred Rock male and the White Leghorn male alive, dressed, and dissected. Observe the difference in type. The long narrow body of the Leghorn and the heavy, thick, blocky body of the Plymouth Rock. A close examination of the photograph will reveal many differences in the size of the various parts, some of which it may be well to mention. The intestines of the Rock measure 70.5 inches, while that of the Leghorn was only 55.9 inches. The caeca in the Rock measured 7.2 inches and in the Leghorn 6.6 inches. The percentage of the dressed fowl to the live weight in the case of the Rock was 90.50 per cent., while that of the Leghorn is 86.80 per cent. In like manner the percentage of the edible parts of the Rock is 75.49 per cent., and that of the Leghorn 66.55 per cent. Again the percentage of the waste parts of the Rock is only 13.42 per cent. in contrast to 16.45 in the Leghorn. Further comparisons are as follows:

Male.	B. P. R.	W. Leg.
Live fowl,	100	100
Feathers,	6.16	8.15
Blood,	3.34	3.34
Dressed fowl,	90.50	86.50
Edible parts,	75.49	68.55
R. arm, first joint,	1.63	1.46
R. arm, second joint,	1.88	1.84
L. arm, first joint,	1.63	1.38
L. arm, second joint,	1.92	1.84
R. leg, first joint,	7.66	6.26
R. leg, second joint,	6.52	5.97
L. leg, first joint,	7.92	6.29
L. leg, second joint,	6.39	5.15
Entire breast,	16.50	15.93
Left pectorals,	7.53	6.80
Back, rump and neck,	19.80	17.25
Heart, .....	.58	.54
Liver,	1.54	1.50
Gizzard,	1.42	2.01
Total waste parts,	13.42	16.45
Lungs, .....	.58	.46
Kidneys, .....	.45	.65
Head,	2.45	5.23
Shanks and toes,	5.86	5.43
Testicles, .....	.73	.30
Offal,	4.66	5.89
Lost weight,	1.77	5.43

These tabulations seem to give a decided advantage, as an economical meat fowl, to the Barred Plymouth Rock.

Fig. 14 shows eight sections of the muscles; those on the left are from the Plymouth Rock, those on the right from the Leghorn. The first two on top are cross sections of the breast muscles. The next two are longitudinal sections of the same muscles. The next two are cross sections of the thigh. The next two are longitudinal sections of the thigh. It will be observed that the muscle, that is to say the lean meat of the Plymouth Rock, has a larger proportion than the Leghorn of the muscular fibres which contain the juicy, tender meat, and a much smaller proportion of the tough connective tissue. The latter being shown by the light portion and the former by the dark.

I regret that through lack of time it has been impossible to take up in detail, a discussion of the problems as thoroughly as it should have been done, and apparently there will be very little opportunity for informal questions and discussions, which to my mind, is one of the most important features of a meeting of this nature. I thank you for the opportunity of speaking to so large an audience and feel very grateful to Director Martin, and trust that I may some day have the pleasure of meeting you again, either in your own state or that you will visit us in New York, where I may have the pleasure of showing you what we, at Cornell University, are trying to do for the poultry interests of the country.

The CHAIR: The next subject for the evening is "Bee Keeping" (illustrated by lantern slides) by Prof. H. A. Surface, Economic Zoologist, Harrisburg, Pa.

Prof. Surface addressed the audience on the subject of Bee Culture, illustrating his remarks by lantern slides, showing the various processes of handling, and the methods of keeping bees, as follows:

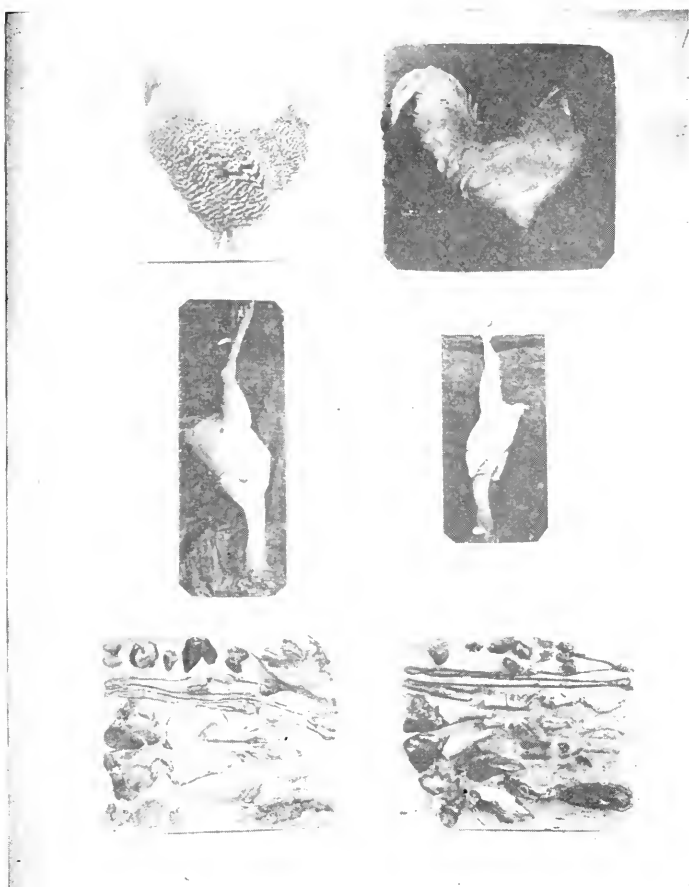


Fig. 13.

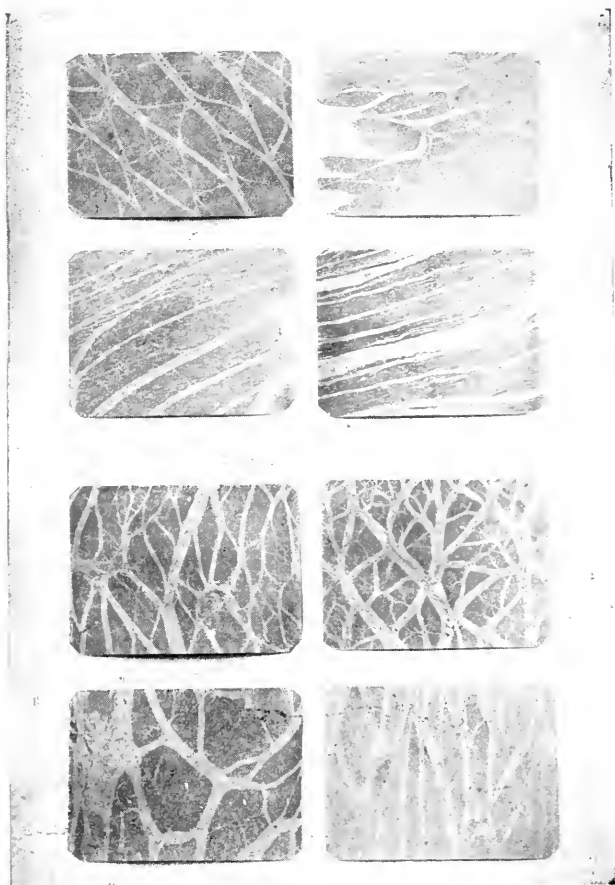


Fig. 14.

BEES AND HONEY.

By PROF. H. A. SURFACE, *State Zoologist, and Prof. of Zoology in the Penna. State College.*

I find "Bees and Honey" is a popular subject when viewed from the standpoint of the consumer, for there are very few persons indeed who do not enjoy this most delicious and healthful food; but from the standpoint of the producer it is not so popular in this State, as we do not have nearly as many bee-keepers as there should be to supply the honey that is desired for use.

I do not understand why there is not more Honey produced in this great State of Pennsylvania, which has flowers of great variety, producing nectar for the most excellent honey, almost all seasons of the year, from early spring to late fall, unless it be that our citizens have not learned the real art and science of bee-keeping. In our State, Nature has done her work, and is only waiting mankind to do his to make this State literally one that is "flowing with milk and honey."

Since having taken up this subject in earnest, and studied it from a printed and scientific source as well as by practical means, I have become convinced that there is no subject along agricultural lines that engages the attention of mankind concerning which the majority of people know so little and of which there is so much to learn in order to be successful. At one time a man who kept a few bees was called a "bee-keeper." Perhaps he was. To-day a man who produces honey is known as a Bee-cultarist or Apiculturist, just as we have Agriculturists and Horticulturists, and he must know concerning his business fully as much as his brothers know of their business, respectively. When he gains a practical knowledge of his profession it is certain to yield him greater returns for his comparatively small outlay than if he should engage in any other side line of agriculture. Concerning the profits from Apiculture, when run in a practical way, there can be no possible doubt, but it is to the farmer who wishes to produce enough honey for his own family and his immediate friends that I wish to speak.

As President of the Pennsylvania State Bee-Keepers' Association, I have been asked by Director Martin to prepare an address on "Bee-Keeping" that might help the farmers of this State. To do this I have prepared many slides for this occasion and shall use them as I speak.

The bee-keeper who is to succeed should know the facts of such subjects, as the honey-producing plants, their date of appearance, the yield and abundance, the general structures, habits and life-history of the honey-bees, the methods of handling bees with safety, the manipulation of them to obtain the best results, modern hives, the best methods of changing from the old to the modern hives, the use of foundation or sheets of wax where the comb is to be found, methods of getting rid of the drones where not wanted and of producing drones where needed, the methods of producing queens or buying queens of a desired strain or race and introducing them into the hive, and getting rid of those already there, clipping the wings of the queen and thus prevent loss of bees by swarming, dividing

the hives or colonies and entirely preventing swarming, moving bees from one place to another, wintering them safely and cheaply, feeding them at such time of the year as is necessary, getting the best results from using pound sections to produce the comb honey in the neatest possible way, or extracting and producing the liquid honey, the method of marketing honey in the most attractive and successful manner, the enemies and diseases of bees, and should recognize these evils and know how to overcome them. There is much more to be said about bee-keeping but this is a synopsis of the points to which I wish to call your attention in this limited address.

What is honey? Honey is defined by the Pure Food Standard as being the Nectar of Flowers, or the saccharine exudations of plants, gathered, transformed and stored by the honey-bees. Thus it can be seen that if a person should attempt to feed his bees with glucose, sugar, or syrup of any kind, and the bees should store it and cap it like honey, this substance would not be the regular article, and any one could be prosecuted for selling adulterated honey if he should sell that which had been adulterated by this method. At this time I wish also to take the opportunity to say that there is no such thing as artificial comb-honey and comb-honey can not be made artificially. The National Bee-Keepers' Association has a standing offer of a forfeit of \$2,000 to any person who will give them two pounds of comb honey so made that it is not readily detected. I am a member of their Publication Committee, and it is our duty to disseminate such facts as these, as it is now quite generally but wrongly supposed that honey is generally adulterated by all kinds of substances.

Honey-producing Plants.—The bee-keepers should know the honey-producing plants of his region, and their dates of yield, in order that he can build up his colonies and get them as strong as possible at the beginning of the important flow of honey, and also in order that he can be prepared for a heavy crop by having all apparatus and parts of the hives ready to be put on or changed at any time, without a moment's delay when the bees have filled the super or storage receptacle. The loss of only a few days during the height of the honey flow often means swarming fever and the loss of a swarm or more. Among the first plants in spring we have all the Maples, which do not yield a great deal of honey, but their pollen is very important in feeding the young bees and stimulating the queens to egg-laying. The Box Elder is likewise an early pollen-producing plant, and the willows, especially the Pussy Willow, are important in this regard. Where these are found in abundance the bees will increase rapidly and will be in good order by the time for the fruit blossoms. However, the blossoms of the fruits, such as peach, plum, cherry, apple and pear are generally of the greatest value in building up a colony and stimulating the rapid egg-laying of the queen, and thus putting them in good shape for the white clover, which is of greatest importance in our country. It is true that for a short time we have a tremendous flow of fine white honey from the black locust or yellow locust, as it is also called, as I know that this spring some colonies stored as much as twenty pounds of honey in one week.

Where bass-wood is yet to be found in sufficient quantities, this is one of the most important honey-producing plants of our State, but it has been destroyed to such extent that it is not generally re-

garded as important in honey-producing at the present time. Sumac and the late maples are of some value, but there is no plant like the white clover. Alsike, where grown, is valued for honey. While it is not generally believed in the East that Alfalfa is a nectar-producing plant, we have recently found Honey-bees, Bumble-bees, Butterflies and Skippers on alfalfa flowers, and we have seen it yield well developed seeds in Cumberland county. It is our opinion that insects would not visit it if it were not nectar-producing. It is one of the most valuable honey-producing plants in the western part of the United States.

After the white clover comes the Mellilotus or Sweet Clover, of which we have two varieties, the Yellow which is early, and the White, which is later, and is prolonged through July into August. In rich damp valleys this is a most valuable honey-producing plant, while on the hillsides and along roads the catnip is often found in such abundance that it is an important factor in producing nectar. The various mints are also important in midsummer and later. Later in the season we have the far-famed buckwheat with its dark well flavored honey, which, where grown, makes it possible for the bee-keeper to remove all the white clover honey from the hive and the bees will make their entire winter store from the buckwheat. In the southeastern part of this State, especially in the low lands and along streams, there is a plant known as the Yellow Plant or Yellow Autumn Flower. When the seed is mature it is known as the Spanish-needle (*Bidens*). This is a valuable plant and yields an abundance of honey for the winter storage. While red clover is grown in this State, the bumble-bees make the greatest use of it, for the honey-bees do not usually work upon it unless the flowers are short, as on sandy soil or during a dry season. While Red Clover Honey Bees are advertised by some dealers, they are nothing more than a good grade of Italians and a great many of them are no better than some of the other strains.

The inhabitants of a hive consist of (a) the queen, who is the egg-layer or the mother of the entire colony, (b) a few or many drones, which are the males and which are present only during certain parts of the year, and (c) a great many workers, which are rudimentary females, and which may develop the function to lay eggs if they be long deprived of a queen. However, their eggs, not being fertilized, always hatch drones. When they are preparing to swarm or when the queen dies, is lost or becomes infirm from age or disease, the bees construct queen cells and feed the larval bees with a secretion from their heads, known as royal jelly, until the young queens are full grown. A young queen then comes forth and takes the place of the old queen. This displacing a worn-out queen by a young one is known to bee-keepers as superseding.

Swarming is nothing more than the old queen leading most of the old workers in flight to a new place and establishing a colony. The new queens are left in the hive, and the strongest one kills all the others. If at any time the queen be removed or lost by any means, the bees immediately proceed to feed royal jelly to some of the larvæ that are less than three days of age and continue to feed them abundantly with this substance until full grown, when they are enclosed in their cells a few days and then emerge as queens. The first one out of the cell bites open the other queen cells and kills

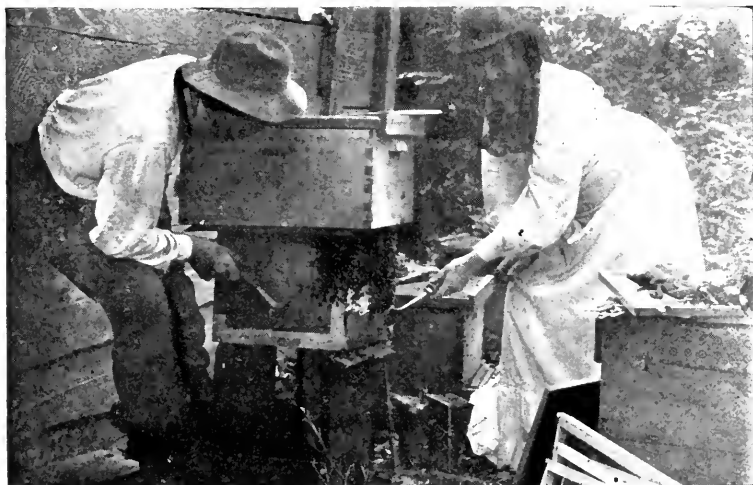
the inhabitant of each. All young bees are fed on this royal jelly, which is a secretion from glands in the head of the workers, only during the first three days of their lives, after which they are fed on thin honey and pollen or bee bread, and then they develop into workers instead of queens, as they would have done if fed differently. Bees do not make queens except when their queen is lost or infirm, or about to swarm.

The structure of the bee is important, as the protection of the bee-keeper depends on it. The bee has two kinds of eyes, one known as the ocellus or simple eye, which is a large single lens, three of which are placed in the head. The other is the compound eye, which consists of a great number of lenses placed together to form one eye at each side of the head. It is known that bees have very accurate far sight and fine near sight, and it is thought that one of these eyes is for seeing objects at a great distance and the other for seeing them at very close range. The bee keeper takes advantage of this and can stand fairly near the hive and is not attacked, while objects twenty feet away, or even more, receive the attention of the angry bees. The tongue of a honey-bee is generally about one-fourth ($\frac{1}{4}$) inch long. While an effort has been made to breed longer tongued bees in order that they may reach the bottom of the red clover tubes, this has not been accomplished as yet. The sting of the bee is attached to a poison sack, and is also provided with muscles to force it into objects. Owing to the backward barbs on its tip it is frequently left behind and causes the death of the owner. If the sting be removed immediately after it is inserted, but little poison passes through it, but if it be left for some time it continues to go deeper into the skin of the victim, and the muscles continue to work and force the poison through the tube and cause considerable pain. In removing the sting the operator should be careful not to grasp and squeeze the sting and thus force more poison into the flesh, but should scrape it away so that the poison will not be squeezed through the hollow dart from the poison sack. Applications of ammonia, soda and water, essence of lemon, or other substances will relieve the pain of the sting, but the bee-keeper soon becomes almost immune to stings and works with the bees with bare hands without fear of being stung occasionally.

The legs of the worker bees are provided with bags for carrying the pollen, which becomes the bread of the young. In their digestive tract they have the honey sack, which is not the stomach, where they carry the nectar which they gather and make it into honey by the addition of a little formic acid. When the bees reach the cells in which the honey is to be stored they disgorge the precious burdens through their mouths.

By a peculiar arrangement of the reproductive organs, the fertilized queen bee is able to lay worker eggs or drone eggs at will. This is because the eggs which are fertilized hatch into queens and workers, and those which are not fertilized produce only drones. The queen mates but once in her lifetime, when flying high in the air, and the fertilizing element is retained in a small sack at the side of the duct of the ovary. When laying the egg, a small portion of this is permitted to reach each of the worker eggs, but in laying the drone eggs this is held tightly in the closed sack.

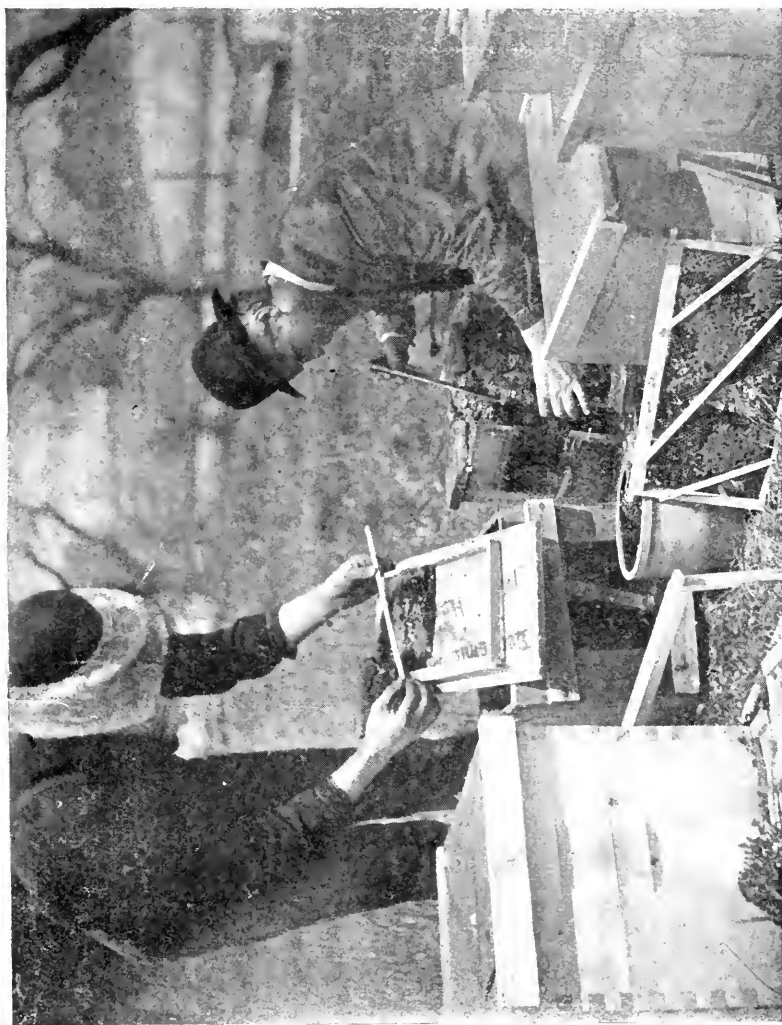
The queen commences to lay eggs in the middle of the comb, near



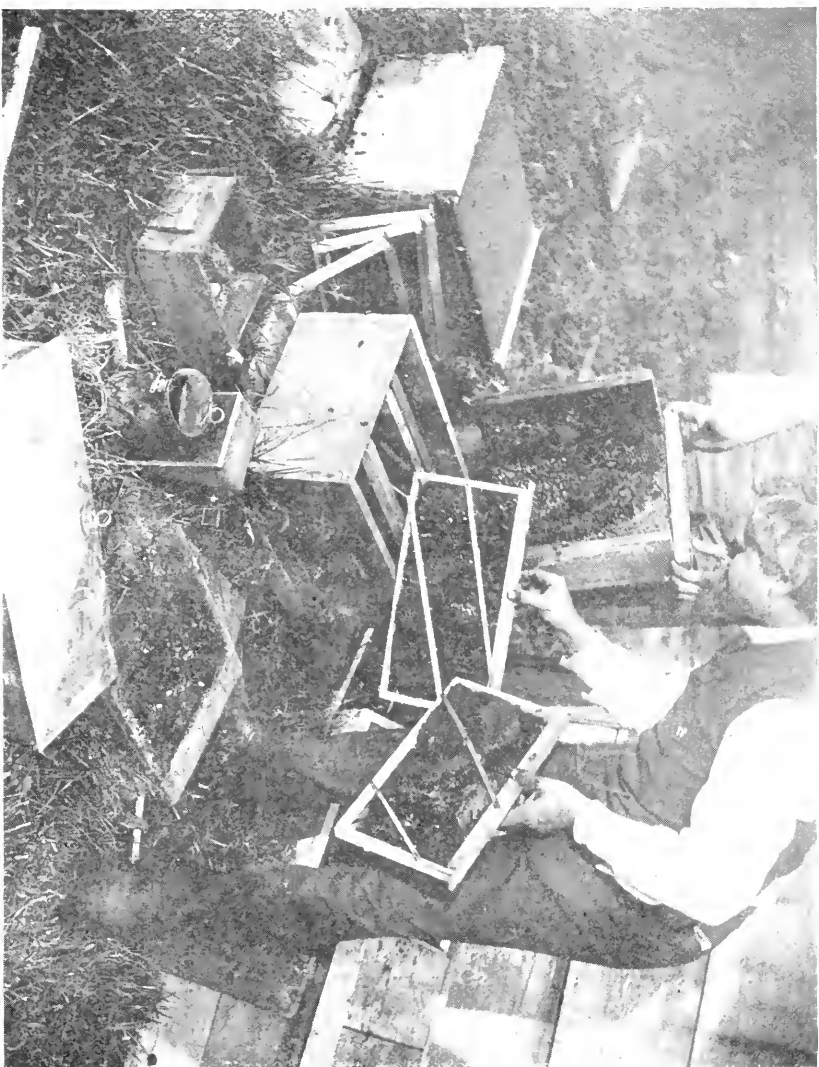
1. First Step in Transferring to New Hive. Driving Bees up from Old Hive into New. Scene in Apiary of Prof. H. A. Surface, State College, Pa.



2. Second Step in Transferring a Colony of Bees from an Old Hive into New. Splitting away the Side of the Old Hive Parallel with the Sheets of Comb. Photographed by H. A. Surface, in his own Apiary.



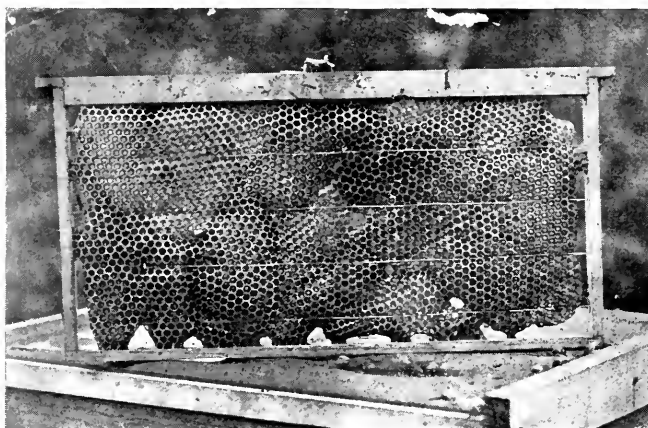
3. Third Step in Transferring Bees. Fastening Combs with Wooden Strips into new Frames for Modern Hives. Photo. of Prof. H. A. Surface in his Experimental Apiary, at Camp Hill, Cumberland Co., Pa.



4. Fourth Step in Transferring Bees.—Placing Newly Filled Frames and Shaking Remaining Bees into new Hive. Photo. of Prof. H. A. Surface and Assistant in Experiment Apiary at Camp Hill, Cumberland Co., Pa.



5. Comb in Center of a Frame Showing Young Bees or Larvæ just Hatched and Surrounded with "Bee Milk" for Food, and also Eggs (White Specks) in Surrounding Cells. Photo. by H. A. Surface.



6. Full Frame of Drone Comb, Made by Placing in one Frame Several Small Pieces of Drone Comb Cut from other Hives. Used for Obtaining Caucasian Drones for Mating Purposes. Photo. by H. A. Surface, in his Apiary.

the centre of the hive. She does this with system, passing around the comb in widening circles from the center toward the outside. These eggs hatch in three days, and if they be made queens they develop into the winged queen and mature in about 15 days. The workers require 21 days and the drones take about 24 days to develop. The number of eggs may vary from 800 to 3,000 per day and depends to a great extent upon the number of bees in the colony to care for the young and the amount of honey coming in. During a time of scarcity there are very few eggs laid and during a heavy honey flow there are a great many if the queen can then find room for them.

It is possible to take advantage of this knowledge and build up a colony by artificial feeding at a time shortly previous to a heavy honey flow, in order to get the benefits of a strong colony at such time. By feeding my bees upon syrup made with granulated sugar (1 part) and water (2 parts), I have induced egg-laying and brood-rearing to such an extent that the hives were full of bees at the height of the fruit season and an immense amount of honey was stored before most of the other bees commenced to do much work.

The most essential instrument in working with the bees is a smoker and I would as soon think of making a practice of driving horses without lines as of working with bees without a smoker. It immediately surpresses all insubordinate bees and lets them know they have a true master. However, bees should not be smoked indiscriminately, at all times, or to a point of suffocation, as even a small puff keeps them in a hive for sometime and consequently reduces their services as honey-gatherers for that length of time. Some persons will go among their bees frequently and handle them with neither veil or gloves and not be injured by them, while others are badly stung and say they can not keep bees at all. We must remember there are three things which arouse the anger of bees, and when they become fully infuriated they become utterly indifferent to their own death or suffering: One of these is a comparatively light tapping or jarring of the hive; another is the breath blown gently on them and also offensive odors from the operator, and the third is the sight of fur or hair. The explanation of this is that for centuries the home of the bees has been in trees and their greatest enemies were the bears and such other animals as could climb the trees. The slight scratching of the bears on the bark of the trees as they climbed was sufficient to apprise the bees of the approach of their enemy, and as a consequence this instinct or inherited fear and quick anger under such conditions is retained to-day. Another thing, the bear approached the hole in which the bees lived and breathed in it and they thus became aware of their enemy and would make an attempt to dislodge it. In this is found the reason for the anger of the bees when a warm breath blown gently upon them. The anger from seeing hair or fur is a relic of the time when their greatest enemies were the hairy animals. Consequently, when bee-keepers go into the bee yard, especially ladies, without a hat or veil it is only to be expected that the bees will be angered and that they will be stung. Likewise it is a common belief that in order to hive bees with the best success the owner or operator should wash himself and change his clothes. This probably has for its basis the fact that bees are offended at certain odors,

as mentioned before. However, the smoker will immediately quell such insubordination, if taken in time, and as said before, this is the most essential implement for the person who keeps bees and produces honey.

It is also necessary to have modern hives with movable frames, as it is impossible to have success with old-fashioned box hives or gums. To use a hive that can be opened and examined in every part at will is as necessary in modern bee culture as it is to plant corn in rows for the modern cultivation of the corn, and we would as soon try to cultivate a crop of miscellaneous scattered corn and produce first class results as we would try to get the best results in bee-keeping by using the old box hives. With the old style hives it is impossible to know when the bees in the hive are diseased and apply remedies, or learn when they have enemies (worms) and remove them, or to Italianize or introduce a new queen, or to find the queen and clip her wings or remove her, or give them the care that is necessary for intelligent bee culture, or to produce either comb honey in sections or extracted honey.

There are many styles of modern hives, but they all agree in having movable frames, suspended at the top or ends, and which can be taken out separately and at will. For general purposes in honey production, we regard the 10-frame dove-tail hive, with style of frame known as the Langstroth, as the best that can be used. With such a hive one should have the super or top fitted with honey sections one inch thick, four inches wide and five inches high. These, when fairly full, will hold just about a pound each. Each of these supers will contain 28 such sections. These hives can be ordered in the flat and nailed together by the receiver, or if he doesn't know how to do this he can order one hive nailed together as a sample and the rest in the flat, and he can then put them together. It is necessary that all parts fit, to the fraction of an inch, and when all the hives are the same size the frames can be changed from one hive to another. We consider it so very important that all the hives in one apiary be of the same size and make, that we have recently thrown away 18 hives of the movable frame type because they were not the exact size and shape as the rest in our regular apiary. Unless one has lumber, tools and time in abundance he can certainly buy his hives ready-cut much cheaper than he can make them himself. I would not, under any circumstances, advise the use of different size and shape hives in the same apiary. This is because of the fact that the bee-keeper often desires to change the frames from one hive to another, and he can not do this without uniformity. When the hives with the movable frames are used, and the frames are filled with straight comb or sheets of wax as a foundation, there is no danger of the bees building crooked comb. However, it is quite necessary that the hives be kept full of frames, and these should be kept so close together that there is just the distance of one bee's-space between (three-eighth inch) them. When the frames stand further apart the combs are quite liable to be irregular in thickness and they will no longer be interchangeable.

In working with bees at any time it is best to wear a veil. The one who works without a veil is fool hardy, but he does not need to work with gloves or hand-protectors, as this is somewhat of an impediment. With the smoker he should puff lightly into the

entrance of the hive, then pry off the cover just enough to allow the smoke to go in but not enough to let the bees out, puff some smoke under the cover and then lift it off, shaking the bees from it near the entrance of the hive. Then pry a frame at one side enough to loosen it and lift it out, shake the bees in front of the hive and stand the frame down against the outside of the hive or at the rear, near at hand. Remember to take out the outer frame first. If it be held fast by burr comb cut it loose with a long bread knife. After the first frame has been removed it is easy to pry aside the other frames, and they can be raised and examined for eggs, drone comb, queens, queen cells, moths, and disease. If worker eggs be found the bee-keeper knows that the hive has a queen and she has been laying within three days. If no eggs be found and queen cells be present he will know that the queen has been lost, probably in the last manipulation, and that the bees are engaged in rearing a new queen. He can then, if he wish, remove all the young bees ("worms" or larvæ) from the queen cells and in their place insert those of some strain or variety which he may wish the new queen to be. In this way he can produce his own queens without trouble or expense.

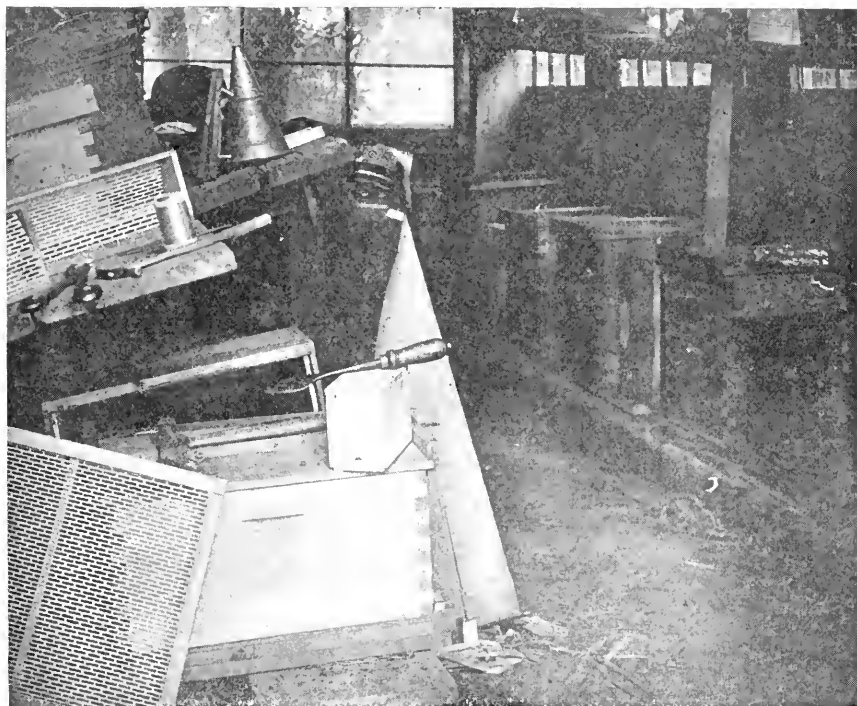
It is very important for the bee-keeper to be able to remove the drone comb when he doesn't want it and thus prevent considerable loss by these lazy fellows consuming good honey. In this way he can also prevent the drones from appearing in certain hives that he may not wish to propagate in his apiary. On the other hand, by inserting drone comb into frames where he may wish the drones he can thus propagate the good qualities of his best hives. The bee-keeper should select for propagation only those which have yielded the largest amount of honey, as it is not at all advisable to rear queens from a poor hive or queen. It is best to remove the poor queen from the hive and introduce a better one. At the end of four or five days cut out all the queen cells that are found in the frames in the queenless hive and out of the desired hive remove a frame with the eggs and insert in the poor hive. From these new queens will be reared. The detailed method of rearing queens is so complicated that we cannot discuss the subject here but would simply show how it is possible. In looking over the frames the evidences of diseases of bees can be found and the proper remedies applied, the larvæ of the bee moth can be detected and removed, the drone comb can be cut out or inserted as desired, and queen cells can be cut out or can be inserted them from other hives. For example, if I have several hives which are not yielding as much as I think they should I can start one of them to making queen cells by the methods mentioned, and when these queen cells are completed and capped they will be about the size and shape of a peanut. I then remove each queen from the hives I wish to re-queen, cut a queen cell from the desirable hive, and set it in the comb of the hive from which a poor queen has been removed. In this way a queenless colony is started to rearing queens for several hives, and I have no trouble in transferring the queen cells with the new queens in them and re-queening each colony.

With the modern frame hives there is no difficulty in introducing a new queen of a different race. I have recently had bees sent from the different states in the Union, and in fact from across the

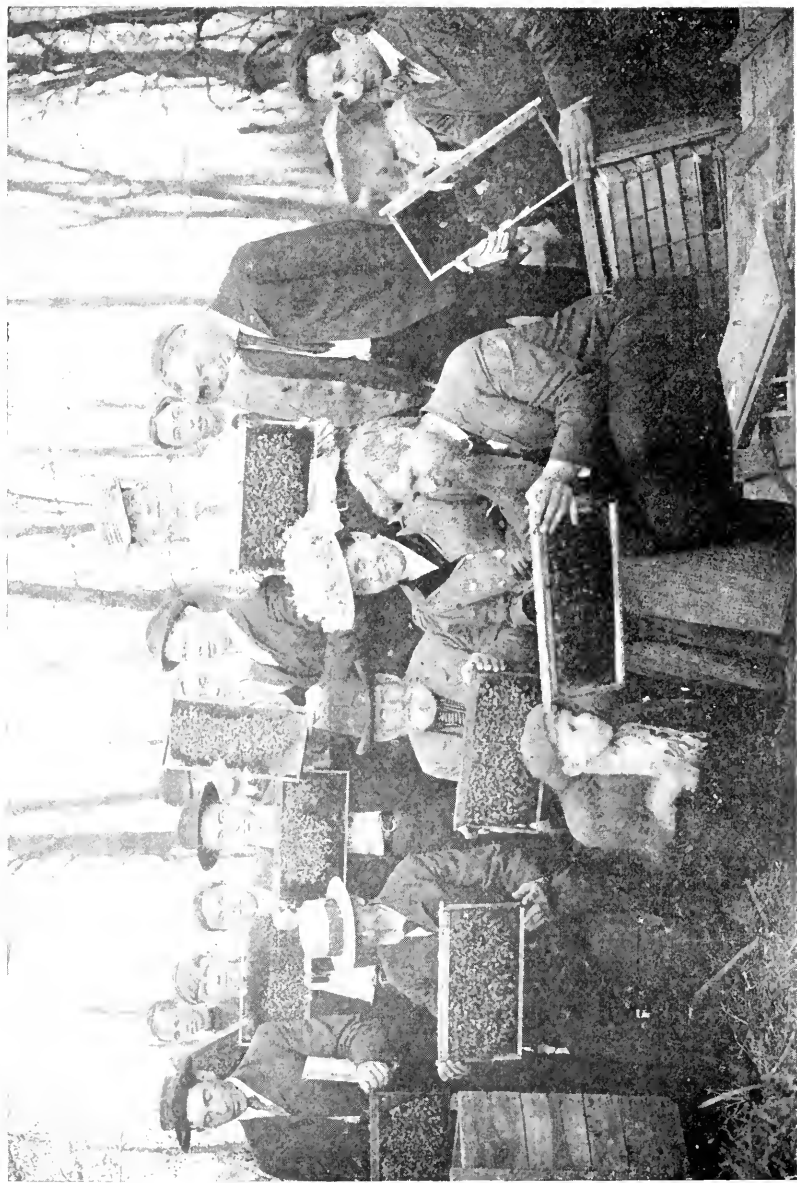
ocean. They come by mail in cages, and all that is necessary is to open the cages and follow introduction methods in some good book on bee-keeping and introduce them to the queenless colony. Have the opening through which the queen would crawl stopped with bee sugar, which is honey and powdered sugar mixed together. While the bees are eating this away to release the imported queen, they are becoming acquainted with her, and in a day or two will accept her as queen. Of course the hives must be made queenless before it is wished to introduce a new queen. This of course can not be done with an old style hive where the operator could not look through the hive and find the old queen. We take this opportunity to denounce against the so called observation hives, which are frame hives with glass on all sides. They are expensive and alluring, and while the outer side of each of the frames that are on the sides can easily be observed, one can not see what is taking place in the interior of the hive and can not see the queen nor the young bees without taking out the frames, as with the ordinary frame hives.

It is easy to transfer bees from an old style hive to a new one. Have the smoker ready for use. The first step is to smoke the bees in the old hive, open a hole at the top so they can pass up through it, set the new hive on top of the old one, and by pounding the old one and occasionally puffing smoke into the same, drive the bees from the old hive into the new. As soon as the queen comes out there will be a grand rush into the new apartment in the upper story. Remove the cross sticks, if any, and split off the side of the old hive that is parallel to the sheets of comb within it, and also split off the bottom or pound it off with a hammer. With a large knife like a bread knife cut out the sheets of comb with honey brood. Lay it on a board and using one of the new frames as a pattern cut the comb to fit the frame as closely as possible. Fasten it in with thin sticks, as shown in the illustration, or with strong rubber bands. If the rubber bands are used they must be very strong, to prevent lopping over at the top. The frames are then put into the new hives. If the comb is uneven it should be cut so as to fit and permit all the frames to be put parallel in the hive. Avoid crushing the bees at all times and especially now, as it is hard to tell where the queen is and if she be killed the most valuable part of the hive is lost.

I have had my students and visitors at State College help me in this work with safety, and it can be done by any one who is willing to undertake it. In fastening the comb in the frames the sticks can be placed either diagonally or vertically, as shown in the illustration. The bees will soon fasten this at the sides and top and the sticks can then be removed and the frames will be in a first class condition. If there be not enough comb to fill all the frames, as many should be entirely filled as possible. Make it straight so that the frames can be put in without crowding the comb against other frames. Where there are any fragments of broken comb left it can be made into bees wax which is quite valuable. If there should not be enough comb in the old hive to fill all the frames of the new hive, foundation sheets, which are sheets of beeswax rolled thin and the impression of the base of the cells marked on it, should be put on the remaining empty frames. All foundation should be fastened in place with fine wire imbedded in it. In most cases where



7. Interior View of Bee House, at Former Apiary of Prof. H. A. Surface, at State College, Pa., Showing Row of Hives (at right, below), Shelf Above Same, and Bee-Keeping Appliances (at left). Photo, by H. A. Surface.



8. The Gentle Caucasian Bees. Hive Opened Without Smoke, and Frames of Honey Comb with Living Bees Held in the Bare Hands of Novices in Bee-keeping. Scene at Meeting of Students and Grangers, at Apiary of Prof. H. A. Surface, State College, Pa.

this is not used the bees will not build the comb straight. This foundation is very important and should be used by all practical bee-keepers.

We have mentioned the possibility of losing bees at the swarming time. This can be entirely prevented by clipping the wings of the queen at any time after she commences to lay, and there will then be no need for the bee-keeper to chase swarms and climb trees to take them down. We have not had a swarm of bees in two years, by dividing the colonies. If the wings of the queen be cut she can not fly, and even if they start to swarm they will miss the queen and return to the hive. If the owner is near he can pick up the queen and put her near the hive entrance, or if the hive be close to the ground she will crawl back into it when she finds she is unable to fly away.

Races of Bees.—There are a great many different races of bees, with varying qualities or characteristics. While it is my firm opinion that the best bee for the American bee-keeper, according to our present knowledge, is the Italian, yet the Caucasian is so gentle as to have earned the title of the "stingless" bee. Students and visitors at the College have handled my bees on the frames without any smoke having been used in opening the hives or any other way, and without veils or gloves, as shown in the illustration. However, with proper handling, the Carniolians and the Italians can also be manipulated without smoke. The Cyprians are the crossiest we have, but they are at the same time great workers. We believe that there is great promise in the improved honey bee which has the Caucasian race for the paternal ancestors and the Cyprian race for the maternal. This cross would give from the male the gentleness which is characteristic of the Caucasian race, and from the female the hustling ability to gather honey, which is a feature of the Cyprians.

Wintering Bees.—We do not think it necessary to have special caves or cellars for bees, although there is great loss in this State each year from the failure to winter properly. We have found that the first requirement for wintering is to have the hives well filled with honey. Each hive should have at least 30 pounds of sealed honey or be fed with sugar dissolved in water till they have that much. In warm weather this can be used at the rate of one part sugar and two parts water, but in cold weather they should be fed in equal parts. Each hive should have a queen and be without disease or moths. When the larvæ of the bee moth is found in the hives they should be well cleaned, and they will be in good condition again. Last year we packed out hives in large boxes with a thickness of four or five inches of hay or straw packing around them at all sides, including the bottom. Arrangements were made for the bees to pass out through a little box for the cleansing fly when desired. We lost but one colony, and that was due to changing them so late that they were unable to put in enough stores to feed them properly.

Bee-keeping for Women.—The success of bee-keeping by women has been proven by many ladies who have handled them with great success, showing they are qualified for this.

Honey producers will find that the pound sections, put on the market in the most attractive way possible, will give them good

profit. If he desire not to produce comb honey but to produce the liquid or extracted honey he will need an extractor. He can then uncap the honey cells in the frame, extract it, and place the comb back in the hives. By careful manipulation he will be able to produce nearly three times as much extracted honey as comb honey from the same bees, because he saves the time of the bees in making the comb and since 15 pounds of honey are required by the bees to make one pound of comb. This amounts to a great deal.

No person should think bee-keeping is all smooth sailing. There are a great many points to be obtained, practical and otherwise, and these are objections to many people. They are liable to diseases, such as Black Brood and Foul Brood which has been known to carry off entire apiaries. They may die by being wet and chilled or starved during the winter and from other causes. It is indeed true that for many persons the knowledge of this subject is very limited. To have the best success, the bee-keeper should read and follow the suggestions given in some of our modern books on bee-keeping and subscribe for one or two of the seven up-to-date Journals published on this subject in America.

In conclusion, I wish to urge the importance of every person interested in joining the State Bee-Keepers' Association to aid in the advancement of this important but greatly neglected industry. We need legislation for the detection and suppression of contagious bee diseases and more instruction in this subject. "In union there is strength." When our State Association is strong enough or has enough members, it will procure for all bee-keepers the protection, legislation, aid and State publications that they need. For circulars concerning the Association, write to the Secretary, Mr. L. R. White, Office of the State Zoologist, Harrisburg, Pa., or to the speaker, upon whom rests the duties of the office of President.

On motion, duly seconded, the meeting adjourned until half-past eight o'clock to-morrow morning.

Court House, Clearfield, Pa.,
Thursday, 8.30 A. M., May 31, 1906.

The DEPUTY SECRETARY: Gentlemen of the Normal Institute: We have now come to the last day of the meeting. Owing to a very pleasant change in the program yesterday, being Memorial Day, we were compelled to drop one session, and by the way, a very important session of this meeting. That session was important because it involved the entire management of township, county and State methods of the farmers institutes of Pennsylvania, hence we appreciate its importance.

There is involved in this the local management of the county chairmen. I have in mind quite a number of propositions which it is desirable to present to the county chairmen of the institutes of Pennsylvania, and by the very many requests coming to us asking that the session be not dispensed with, we have finally decided that at least the one-half of the forenoon shall be devoted to the interests of farmers' institutes.

Before entering upon the work of the session, I want to make a

statement or two. I am in receipt of a letter from Professor Wells W. Cooke, one of our excellent scientific institute instructors, of Washington, D. C., stating that he is prevented from attending this meeting on account of the severe and probably last sickness of Mrs. Cooke. In this sad hour we all join in heartfelt sympathy.

Also that Professor Surface, being President of the Bee-Keepers' Association, asked me to request all persons engaged in bee-keeping in Pennsylvania to send to him at Harrisburg, Pa., their post-office address, as he desires to correspond with them. Please bear that in mind all those who are engaged in bee-keeping.

I think there are no other announcements, except to say that those persons who were placed on the program for what will be the regular session this morning, all I believe have manuscripts, and if time will not permit them to be heard, they will be printed in our bulletin, giving the proceedings of this meeting, so that if you do not hear these papers to-day they will all come out in printed form in due time.

MR. HUTCHISON: Mr. Chairman, I move that the Deputy Secretary be requested to send a telegram of sympathy to Prof. Cooke in this sad hour.

The motion being duly seconded, it was unanimously agreed to.

Mr. A. P. Young, of Millville, Pa., in the Chair.

MR. YOUNG: We will now take up the order of the day. The first thing in order is the discussion which is to be opened by our worthy Secretary Martin.

The DEPUTY SECRETARY: Mr. Chairman and Ladies and Gentlemen: When we are at home and in our office sometimes we think of some very elaborate things which we desire to express and present to the Institute. There are two or three reasons why I shall not give a long talk as I had expected and intended to do; one is, that about ten days since I was taken with a very severe and heavy cold which simply prohibits me from using my voice beyond a certain stage, and you will understand that I must necessarily abbreviate. There are, however—and I want to say in the out-start to the County Chairmen of Institutes, that whatever of success and advancement in the great work devised for the instruction of the farmers of Pennsylvania, is largely due to your untiring and unselfish effort in the counties which you represent.

Now do not understand by this statement that you are all perfect men; do not understand that you might not have done some things which might have accomplished better results. Indeed, whenever the time comes that we have arrived at such a condition when nothing better can be done, our work will have been accomplished in Pennsylvania. But let me say quietly to you, that as long as man tills the soil on this great earth of ours, the time will never come when it will not be necessary for the farmer to procure and secure knowledge, practice and instruction, greater, broader and deeper than he has already attained. The reason for this is, that agriculture embraces and gathers within itself all other sciences; chemistry, botany and everything pertaining thereto, and those sciences are based upon great natural principles; principles that emanate from

their source in the great Divine mind, and can you not readily see that the mind that is finite will never be able to fathom the depths which we must search after in order to arrive at the best conclusions and the best practice upon the farms of Pennsylvania. This gives us some idea and enables us to some extent to appreciate the high and the vast work in which we are engaged, and in order to be more direct, I have thought and now fully believe, that in the history of farmers' institutes in Pennsylvania, that we ought to have more compact county and township farmers' organizations; that we ought to have in every county in Pennsylvania, a permanent organization of farmers known by some appropriate name, organized as a continuous body in order that we may carry on this work more efficiently in conjunction with the Department of Agriculture, and to uphold and sustain the hands of the county chairmen of institutes. With that object in view, we have prepared and arranged a constitution for county farmers' institute-societies providing for the organization of such a society in every county in the State. We have had this printed. We want the county chairmen of institutes and all others to get a copy, and if some one will please distribute those now among the audience, I shall be obliged.

The need of such an organization is imperative. To-day there is just one organization in Pennsylvania which gives you, as the chairmen of institutes, the right to ask a man to serve and aid in this work, the county society, and if he chooses to serve, we recognize him as county chairman of institutes.

Now there has grown up in Pennsylvania many organizations of farmers. We have farmers' clubs, farmers' alliances, farmers' unions, local granges, Pomona granges, those in all or nearly all of the counties of the State, and these various organizations are organized voluntarily and thus they help you along.

Now if you will examine this constitution you will see that it provides—that out of these organizations, they can elect a committee, they can elect a representative from all these organizations, and they will form the executive committee who will make arrangements to help along with the local work of these farmers' institutes.

What we want to do, in my judgment, is to so arrange matters that we will have in every county and township in Pennsylvania an organization of men devoted to this work. There is just a little more about that yet. It is my duty and it has been my work for several years to collect from the agricultural societies of Pennsylvania the statistics of their fairs, and exhibitions, the moneys expended, and I am in particularly close touch with them. I find that probably more than a half of these county fairs do not really represent a real agricultural fair or agricultural exhibit.

Now what do we want as farmers? In my judgment, to get an organization of bona fide farmers who have at heart this work. There is an Act of Assembly under which some of the county chairmen of institutes have been acting very wisely; even this county of Clearfield has availed itself of it; the county of Lackawanna, where Mr. Northup has had charge, has availed itself of these aids; so I say we want county farmers' organizations and agricultural societies that will raise funds to the amount of a hundred dol-

lars; they can draw from each county an equal amount of a hundred dollars to be used for agricultural education and development.

Thus when we form an organization of the character here intended and get your societies in the townships and counties thoroughly organized, you will have a demand for fifty or twenty-five days of instruction, as you choose to make it, and get a thousand or two thousand members. Then you will be able to raise that hundred dollars without an effort and draw the additional hundred dollars from the county and be equipped, not only for agricultural exhibits in these institutes and other places, but you will demonstrate that you are actually engaged in developing agriculture in your home counties.

A Member: Does not the law say that it must be a free contribution?

The DEPUTY SECRETARY: It is a free contribution; it is for the purpose of agriculture and no other.

Now that is not all that is in our mind about this matter. My friends, agricultural education, in order that it may be accomplished satisfactorily, is a great work, and to a great extent is twofold. The first is to have mentally conceived an idea, and the next part of that education is to carry it out with your hands in actual practice. We have come to a time in the history of farmers' institutes in Pennsylvania in which we not only give and must give the correct oral instruction in open farmers' institutes and we can never dispense with that—for as long as man lives and has a tongue and intellect, we must have oral instruction, but then, in order to couple together these two great principles, we must organize in these counties for actual practice, namely, schools of practice in our institutes running for a week or two weeks in the different counties of the state in which we will take up such subjects as dairying, and we want to enlist the young men as well as the old in the work, and have a two weeks' school at some of the dairy farms, and gather in a hundred young men and old men, and go through the actual practice, not only teaching by word, but by practice.

We are approaching that time, and when it comes, then we will have with it, out on these farms of Pennsylvania, men who, when they enter upon any special line of farm pursuits, will not only have the mental knowledge, but the practice to carry that on to success.

Now I have developed to you somewhat the degree of instruction both oral and practical that I think we should have in these farmers' institutes. I do not know how you feel about this, I think I know, but I may be mistaken, but I am certain that you are all interested in the work; I know that from the conversations and letters I have received. Take the suggestions home with you, and discuss them in your grangers' and farmers' unions and amongst your friends, and in counties where there is no organization, and start to work and form these organizations, and when the next Legislature meets, we will have the law so amended that it will amalgamate and bring together all the different organizations in one great combine for united effort in this work.

My friends, until that time comes, some improvements which we think should be acted upon by the County Chairmen, which are es-

sentially necessary under existing conditions, and I know you will not regard me as censorious when I say that there is not a county chairman of institutes to-day who has fulfilled his duty as he ought to, if he has not had prepared at least six weeks before an institute is to come off in his locality, a complete program for that meeting, and had it printed, and that program ought to be printed in numbers—large numbers, and distributed throughout the country as a means of giving information to the farmers of that county as to who of the State speakers will be present, the topics they will discuss, coupled with an invitation to be present.

I believe that in every county except two or three, this has been done. I know that one or two counties failed to print programs, and I call attention to that. We suggest that the program for each institute, say there are to be held eight institutes in a county, four two-day institutes, where the practice has been to have the program for one printed on a separate sheet of paper. The next one is printed on another sheet of paper and so on; the expense in that way is almost trebled. I advise the county chairmen of institutes to go to some printer in their county and have the programs for all the institutes of that county printed together on one sheet; go to that printer and find out what he will print a certain number, one thousand or two thousand for, and have them all printed on one sheet. That becomes an advertisement not only for one institute but for all the institutes in the county, and in that way you will get them all printed so as to cover all the institutes to be held in the county nearly as cheaply as you will the programs for one institute. I throw out that suggestion to you now. I think it would be good practice. I want to suggest further, make that a business proposition everytime. I do not mean by that that you should go to the printer and try to "jew" him down, not that, but make it strictly a business proposition.

Now my friends, I want to commend these county chairmen for a good many things, but time will not permit me to commend you for all the things I would like to mention.

There is one matter to which I wish to direct your attention. These speakers who come from a distance, you know they are engaged in a very arduous work. They are often obliged to travel by day and by night; they endure great exposure, and the time has passed, my friends, when the impression that once prevailed to some extent in Pennsylvania that these fellows were traveling around over the State having a good time at the State's expense, needs refutation. You know and I know that such is not the case, and no county chairman of institutes has discharged his duty to the fullest extent that has not arranged for a hotel or suitable stopping place for these lecturers and procured a separate room for every one of them. The State is willing to pay for that, such accommodations ought to be provided, and provision ought to be made not only for a separate room, but if the weather is cold and severe, that room should be heated and made comfortable for these lecturers. Why do I say all this? Simply because these men have to talk in rooms where the ventilation is frequently not good, and they have to talk there for an hour or two hours and they leave that room with their physical condition somewhat depressed, and a good deal heated, and then they go into a room in which no one has slept for probably

six months. Now just imagine the effect upon that man. We call your attention to these things. It don't make any difference whether he is at a farm house, a hotel or a boarding-house, he should be suitably taken care of, and the State is willing to pay for it, and we believe it pays you in any way you consider it, because we want to keep these lecturers in the very best physical condition, possible, to get the best work from them. I could name one of our lecturers, one of the finest on the force, who had to sleep one night in a room that was down below zero. I call your attention to this seriously and earnestly.

Now, my friends, if there are any questions which you want to ask in regard to other conditions about this institute work, we will gladly talk along that line, because you know, this meeting was set apart for the exchange of expressions and experiences and the object is to open up all these questions that arise in the course of our institute work, and the desire is to have a free interchange of experiences and expressions as to the best things to be devised for the management and the carrying on of this great work of farmers' institutes, and unless you have some questions to ask regarding this matter, I will take my seat and the meeting will be opened up for your free discussion.

I see my old friend Agee in the room, and before you get properly upon this work, I would like to hear from him.

MR. AGEE: Mr. Chairman, Ladies and Gentlemen of this Normal Institute: I want to thank you for the greeting given me, and I want to say that I look forward every year with pleasure to your spring meeting. I know you men, the most of you, personally, and I know your worth to the State, and I say this without any desire to pay you an empty compliment. You are the President, you are the Board of Trustees, you are the Faculty of the popular Farmers' College. That is true in every state. These institutes are the popular farmers' colleges in the land and the work you are doing is an educational work of the greatest value in the building up of a more intelligent and scientific agriculture. You give up your time to it, and as I meet you here each year and think that you have in Pennsylvania a great body of men who are willing to do all they can for agriculture, it is one of the pleasant sights and the meeting is one of the pleasant meetings that it is my privilege to attend. I look forward to these meetings on account of the profit I expect to get from them.

These Normal Institutes are of great benefit to the State, and an important part of the educational work of the State, and they furnish the means of making better lecturers, and that is the demand all over this country. We are now only at the beginning of a new educational scheme the institutes are developing along various lines in our various states. You Pennsylvanians are improving the institutes of your State and are working along good, practical lines. In another state you will find that the development is a little different, but you have a common purpose. The efficiency of your work depends upon you, and the Normal Institutes are designed to make better workers of us all.

Now yesterday, when I had the privilege of listening to a number of lecturers, that especially of Professor Massey, it seemed to me worth a great deal, that we could be brought together to study the

soil fertility problem; that is the one that interested me most, and it seems to me very desirable that we should try to get together on a certain line of teaching that we can carry to the farmers—that we should get a line that it would be safe for them to accept, that will mean soil improvement.

I won't take up your time; I have no special message for you just now. I came in here as an old worker among others merely to enjoy the privileges of the meeting. I think you are doing a great deal, yet I think sometimes you might do more; you might send a few of these men to the State Legislature for the good of that body and when they get there, we might be able to secure appropriations that are needed for the better development of agriculture. If you pick out some leading member and make him the Governor of your State as representative of the farmers' interests here, then it seems to me that you would have been doing your full duty for Pennsylvania.

Again I thank you for this kind greeting. It is one of the pleasures each year to me which I always look forward to, and I wish you continued success and hope that your efforts made in behalf of Pennsylvania agriculture may bear such fruit as to put it on the plane where we all wish to see it.

DEPUTY SECRETARY MARTIN: Now if there are any questions let them come in now.

MR. HUTCHISON: Will it not be better to call the list of counties?

The DEPUTY SECRETARY: The trouble with that is, it exhausts a great deal of time; whatever you have to say, say it.

MR. NORTHUP: Mr. Chairman, I would like to talk five minutes; I am just persuaded that this is one of the most important sessions that we shall have in our spring meeting and I feel that it will have a very important influence upon the work which we have to do. I have been a chairman in the conducting of farmers' institutes for ten years and I have had the hearty support of Brother Martin in all that I have undertaken to do or I could not have undertaken the work, and when he called up that subject this morning in reference to better institute work, I thought that is just what we had to consider and just what we have been endeavoring to accomplish.

Now in the first place, the county manager has got to be a grand good beggar, because my brother over here says that the money secured has got to be secured by voluntary contribution, and it is one of the hardest things in the world to touch a man's pocketbook, or anything there is concerning him that costs money and the fellow that stands up before an audience of people to get the money has got to be a grand good beggar. I think sometimes he ought to go into a Methodist meeting and hear the presiding elder beg, for some object for which he wants to raise money in the church as an object lesson, for he certainly wants to be a good beggar.

I remember an instance in which a young man was going to be ordained for the ministry, and they called together a large council of brethren and some old ministers and they were about to ordain the young man, and one of the old ministers stepped around to the

front and wanted to know of the audience how much they were going to give him as a salary, and they told him they were going to give that young man a salary of a hundred dollars a year, and the old minister stepped right up to the front and he said, "I would like to know if there is any brother here who has a long ladder," and one brother said, "I have got a pretty long ladder." "Well," the old minister said, "I want one long enough to reach from here clear up to the good place, so that the dear young fellow you are about to ordain, and whom you propose to give a salary of a hundred dollars a year, shall have the privilege of going up that ladder every Monday morning and coming down on a Saturday night so that he can preach to you, for he never can keep soul and body together in this world on a salary of a hundred dollars a year."

Now an institute manager has got to have this power to influence his people and to get this money, and if he is a grand good beggar he can just get this hundred dollars and he need not fail.

I said to our people in Lackawanna county, "I will assure you of a hundred dollars at the close of our institute, and then go down to the County Commissioners and we will have a hundred dollars more;" and some one said, "What are you going to do with this money?" I said, "I am going to hire the very best men as instructors that I can get in the State of Pennsylvania, I am going to get the very best men there are on the force to come and work in the farmers' institutes in this county, and I want to say to you that the time has come when not every fellow can stand up in a farmers' institute and instruct the people. You have got to have the very best men you can get hold of, and this \$200 is little enough to enable you to succeed in your efforts and to bring in these men.

MR. BLYHOLDER: Mr. Chairman, I would like to say that for ten years we have never failed to get this hundred dollars and last year we got \$101.25.

MR. NORTHUP: You can get it, and you can push an institute with enthusiasm. There is so much depends on the county chairman to make it a success, that he has got to be master of the situation. He has got to study his business, and if he gets it in his mind, lays out his plans, it won't do for him to just trust to his memory, but he has got to have a little memorandum right here in his pocket, on which he will have noted all the arrangements he has made, and then when he wants to know just what to do when he starts his meeting, he can refer to his little memorandum and see what comes next. He has simply got to glance at his memorandum there, and see what is on the program, and he can carry his institute right straight through. He has got his helpers right there, and every thing in order and the institute with such an arrangement as that will be a success all over Pennsylvania.

You take an institute manager like that, and you will find that the politicians all over his county will come up to him and want his support. They will say, you know more farmers in this county than any other man there is living there, and he will be sought for.

A Member: Mr. Chairman, I would like to ask the question whether when the County Commissioners pay \$100 if an additional \$100 can be secured for institute work?

The DEPUTY SECRETARY: No, it cannot.

MR. MILLER, Somerset County: Mr. Chairman, I have listened to the orders of our worthy institute manager that we should keep the lecturers in good condition as soon as we have them in our hands. It is an important matter. I know that in our county of Somerset we can't always do it. We had an institute in one part of the county, in a little town where we had a hotel which we expected to be warmed up and they promised to have it warmed up, but I am sorry to say it was cold weather and it had not been warmed up to any extent, such as we would have liked. They were not prepared to do it; they did not have the heating apparatus in, that they should have had although it was not as I say, much of a place, just a small place in the country where it was not up to date.

Now it is a hard task always for the county chairman to have everything just right. The appropriations given to him is not sufficient to carry on the work as he should. He does not get enough. Twelve dollars and a half a day will do for the day but to prepare for the institute and to do all this advertising which is proper and right, it is not enough money, and the appropriation ought to be larger. We spend a great many days that we have nothing for, not a penny, and the chairman gets discouraged when he has to spend so much time just for the benefit of the farmers in his county. The farmers don't appreciate it. They say, "That fellow is in it and he makes lots of money out of this business." You will hear that in every county. I thought myself when Senator Critchfield was chairman that he made something out of it.

The DEPUTY SECRETARY: You learned a lesson.

MR. MILLER: Yes, learned better. I don't complain about that; I am willing to spend weeks in winter when I haven't much to do in this work, but really I don't want that cast into my teeth that I am making money out of that. I don't like that.

A great deal depends upon the county chairman, and if he can get to help him men to stand by him and make out a program, his work will be much easier. We have different committees appointed to come and help us make this program, but they generally throw the burden on the chairman.

The DEPUTY SECRETARY: Don't you think that if you had an organization such as this constitution provides for, you could do better.

MR. MILLER: I believe that is a good thing. I believe there ought to be more agricultural organizations, so it would come home to every farmer in the county, as near to his home as possible, and have these local institutes and county institutes all through the winter and get the people aroused all over the county and have fifty institutes instead of two or three or four or six—have fifty different places if possible to hold these institutes, and I shall do my best to establish this organization in Somerset county.

MR. HEGE, Franklin County: Mr. Chairman, we have a county organization in our county, and some eight or ten years ago we did have some trouble at first to get the people together. For fifty

cents they can be a member of our organization, but since that time during our farmers institute sessions, we have somebody that goes around in the audience quietly and explains to them, whilst it has been explained before by one of the lecturers, but explains to the people the importance of being a member of the association. Now then, last year we drew \$90 from the county.

My short term as a member of the Board expired a year ago last winter. I believe Mr. Martin was present the night I was elected. I stated there at that time the fact of my being a member for the fourth time in the Board. I was elected whilst I had to go to the telegraph office—I was elected the fourth time. Now I stated that I would prefer not to serve; the reason is not because the work is unpleasant to me, but because I have every year to spend some of my own money in addition to the amount of the appropriation in order to make my institutes a success. I won't have a failure if it can be avoided so I went down in my own pocket. The committee—our executive committee agreed to make good all the expenses I had there over and above the appropriation from the State. They agreed that they would make that up, which they did. Take for instance, one of my institutes last year, where I arranged with the committee on program; I allowed the committee to spend what is appropriated, twelve dollars and a half, and when I came to settle with them, they had spent eighteen dollars there at Fayetteville, and they asked me to pay the bill. There was \$45 coming to me from the State, and I had the programs to pay for, my own car fare and hotel bills to pay, and sometimes friends came from a distance and I took them with me to the hotel and paid for their dinner, so you see where I was, with that \$45 where they had spent \$18 as I stated. You may want to know how they could spend \$18. Well, they were determined to make a success of it and had to spend it. The only trouble with us is, not because we don't have enough people, but the trouble is how to provide room for them, so we get the best and largest church in the town.

There was a musician in the college, it was his home college when he was a boy, one of the best musicians we had in the county, so they got that man to come out and they paid him \$10. It looked like an extravagant sum, but I didn't regret it, for in that church we lifted up everybody that was there, and so in that way it is a great benefit to have an organization and these members of the organizations will help you to make your institute a success.

Now there is one question that I would like to ask my friend Martin: You recommend to us to have our programs all printed at one printing office, and the same program for all the institutes. Now I do not see how it is possible to do that. At Fayetteville we have several gentlemen who are leaders, who head the program of that institute, then we have a Music Committee; now then it would not be suitable to use that program we have for Fayetteville in other places.

THE DEPUTY SECRETARY: Just let me make an explanation. My recommendation was not that you should have the same program for each meeting, but that you should have your program, for example, your Fayetteville or your Marion or your Chambersburg meeting separately—have a separate program for each meeting, but have these separate programs all printed on one sheet or folder,

or pamphlet, in order that when you come to hold your institute you will have all these programs for these different places on the one pamphlet or sheet so that all the people who attend the institute will see that you are to hold an institute at such a date at the other places in your county where you intend to hold them, whether it be at Marion or Chambersburg or elsewhere in your county, and in that way those who attend each meeting will see what is to be done in your other meetings and it will be an advertisement and they will then know what is going on all over the county. Do you see the point?

MR. HEGE: Yes, I see the point. One of the chairmen told me once that we could save money by having our programs printed all by one printer. Now I am a subscriber to all our county papers and two or three years ago they took a program for the institutes all to one office; they got the four programs all printed for \$10.00, whereas they often charged me from \$1.50 to \$5.00 for a single program. When we came to get our institute advertising in the papers usually they put in a local for us naming the dates when our institutes were to be held, etc., and the lecturers expected and so on. Now there are four printing offices there and they complained and said to somebody that we gave all the printing to one office and they never put a single local notice in the papers that did not get any of the printing, about the institutes. Now that is one reason why we get them separate if it does cost a little more.

DR. CONARD: Mr. Chairman, the amount of money not being sufficient struck me rather forcibly. I thought our brother from Somerset seemed to think he was a little short of funds to carry on the institute work. I think that the plan our good friend Martin has outlined is an excellent one, and I think it will very materially reduce the expenses.

MR. MILLER: I would say that we always do that.

DR. CONARD: And I believe also that twelve dollars and a half a day is plenty. I do not think we need any more than that amount to carry on the institute work. If it cannot be carried on for that amount, I think there are plenty of local contributions which will be made to meet the deficiency.

In our own county of Chester I have had institutes held, the very best institutes we have had, for much less than twelve dollars and a half a day and I have had some that cost a little more than twelve dollars and a half a day. Right there seems a condition, and I would like to call Mr. Martin's attention to it as well as the rest of those present. We have one organization in our county who own their hall; they are a good live organization and they have an institute every year. They own the hall and they expect their \$25 every year if they hold a two-day institute. They say they are entitled to it by the bulletin; that it is so stated in the bulletin that they are entitled to it.

While they do not say it in these words, they give us to understand that it is none of our business whether they pay \$5 or \$20 for the rent of the hall; they furnish the hall and they want the \$25. They hold the institute, they make the program and furnish the

program and the advertising and it is always a success. Now I think that a good little bit of that money goes into the treasury of that organization and is not spent for that particular institute. They boasted that they had paid a good dividend on the money invested in the hall and I know that we helped them to pay it.

I would like to have some instruction that would make it so that I could say to them that they can have just so much rent for that hall, and that the institute can be held for less than twelve dollars and a half a day, which I believe it can, that I would be instructed so that I could use the remainder of that \$25 at such other point as would be best in the county. We usually hold another independent institute in our county. Sometimes I have a little money left and when I do I am glad to do it.

I think if I had such instructions as that, I could have more, and have enough probably to hold one or two, or two or three more days of institutes for the same money.

MR. BLYHOLDER: I would like to ask whether you have been giving them that \$25.

DR. CONARD: I have; I did it, but I did it under protest.

The DEPUTY SECRETARY: You have asked a question Brother Conard as to your duty under the Act of Assembly; that Act provides that the expenses per day shall be twelve dollars and a half providing the actual expenses amount to that much. The Act does not say that there is absolutely twelve dollars and a half set apart for local expenses, but it does say that providing the actual expenses amount to twelve dollars and a half a day, that is the limit. We recommend to the chairmen under this Act to keep the fund within their own control. I would suggest that you make arrangements with the local people there for the use of that hall for so much and pay that and no more; so much expense for the hall, so much for their advertising and local expenses, and so on and so on. You are then acting in conformity with the law governing you in that case. I know that you may delegate your power to these people in a legal way, you may throw this fund into their hands if you so choose, but you are the arbitrator, you are the one who under the Act of Assembly the Department must look to for the careful distribution and expenditure of this fund.

DR. CONARD: That is all right, but their bill comes like this; they say so much for advertising. Now they are not always in harmony with us; they do not always adopt our advertising, but they usually get some more bills struck to suit themselves. They make the advertising bill of pretty good size, so that really when it comes to the settlement, it takes all the rest to pay them for the hall, for they are a little like the traveling man with the suit of clothes. Maybe you don't see it in his monthly expense account but it is in there all the same; so they get it in. I think it would be better if we were instructed as Mr. Martin says in the Bulletin. I have no doubt that we are so instructed now, but if there was another clause added in the Bulletin that we should be rendered bills for every item of expense incurred at each and every institute, and that we are held accountable to the State for those bills, I think it would be better.

The DEPUTY SECRETARY: That is exactly what you are.

MR. BLYHOLDER: I am rather surprised at the remarks of the gentleman. I have always felt that I was responsible, and required to render a bill for every cent of expenses and I am surprised that any gentleman could draw that amount without rendering bills. I have felt this way also; in one locality in the county which I represent and have represented for a number of years, they have been accustomed to hold institutes irrespective of any consultation with me. They said, we are going to hold these institutes. I said, all right, you can hold them but you will get nothing from the State appropriation. The result was that they kept them up for two or three years and then when they went to arrange for the next institute or before they arranged for it they sent a delegate to the meeting and they begged that we would go in partnership with them, and we did, but we had control, and we retained control of the institute fund right along.

My method of holding an institute is to meet with the committee wherever I intend holding an institute, and I assist them in preparing the program. When the time of holding the institute comes, I meet my speakers and stay with them until they leave the county, and I pay all the bills for hall rents and whatever our necessary expenses are, and then I will render that account to the State, and in a number of years experience I have never drawn the amount of twelve dollars and a half per day because I believed it was not just, because I had not expended it. I think that is correct. Am I not correct, Brother Martin?

The DEPUTY SECRETARY: That is correct.

MR. BLYHOLDER: I want to say that I am glad our worthy secretary has presented a schedule, or a plan or a draft of an organization, such as he presented to us this morning. I have felt for some time that it was necessary for us to do something of that kind, and in the last two months I have been in correspondence with the various townships and the people in my county. This has always been a lame point in my county to get a representative for the June institutes. I am sure that I am very glad that this suggestion has been presented; if that is not just exactly what is wanted, I know that the Secretary will agree with us if we change it to meet the various wants of the different localities.

The DEPUTY SECRETARY: Certainly, this is simply a draft or a general outline, subject to such modification as may be required.

MR. BLYHOLDER: I think that the conditions are such that something of this kind is necessary, and I hope that we may have these organizations in every county, so that they may bring their influence to bear on legislation by means of which we shall be able to secure more satisfactory results than in the past.

I think that we ought to go further, and in a measure substitute these organizations which we propose organizing for the many so-called agricultural societies that are at present organized in our county, that perhaps have not an agriculturist holding in the whole association. Now it seems to me that we ought to substitute these

proposed societies for those which are now drawing this hundred dollars from the county. We know of a number of instances where they are doing that, and it seems to me that we can't organize too quickly. We ought to have that other hundred dollars that the good brother says he begs still. We need it.

The institute work is an educational work, and referring again to what was said by the Secretary, I like his suggestion in the way of programs also. The good brothers adjoining me in Westmoreland county—we tried an experiment something along that line, but his suggestion goes further, and more, his experience also goes further than that of the good brother, and I think it a good idea to follow out in the printing of the programs. I think that the programs should be printed with the subjects upon each program together with the names of the speakers, the dates, etc., of every institute in the county. We have tried that and it was a success, although I feel that we can improve that by putting on to that program the subjects that the local speakers are to discuss and preparing a local program for every meeting. The plan that we followed last year was, I think, a success, and I believe a little in advance of what we had before, because we took just the subjects that were suited to the audience that was present. You know in some places where institutes are held, the audience may perhaps be an audience interested in dairying, while in another place their interest is in some subject entirely different. That afforded the opportunity of taking from the program the subjects suited for the persons present, and we tried to do that, and I think it worked admirably.

Now another matter, I endeavored to arrange when they were together in the June meeting—I said to them, “Do you want an institute?” And if they said yes, I inquired, “What are you going to do for that institute? Are you going to furnish the hall or are you not?” If possible we required them to furnish the hall free, though I have had to pay for it on various occasions, and even sometimes been obliged to put my hand in my pocket too. It don't go very good when we have to expend our time and then in addition pay out money of our own for expenses. It seems to me that by forming these organizations and going to work together we can carry on our institutes very successfully, and more than that, can combine with them more educational work that is so absolutely necessary for the farmer to-day, and in the way of music I would say that in some places we must have music, must have a band and some places pay for it, as the good brother has suggested. I have come down to this. I say to them if you want to furnish us with entertainment, very well and good, we will thank you very much if you do, but if you can't do it without having us pay a large amount for it, we must omit it. You know farmers are often good musicians and in many places we have just as satisfactory music as though a band was employed.

MR. BEARDSLEE: Mr. Chairman, I have been to the institute round-ups a good many times and I do not know as I have ever occupied the floor before. In five minutes I will say all I wish to say. When I was twenty-two years of age I was put in charge of a school-house over a large district, and after I had engaged to work through the winter at my first school, the district was divided, and I was put in over the advanced scholars. I worked along

until the county superintendent came in, and at that time I had forty-four scholars ranging from sixteen to twenty years of age, and they all had been well instructed; their school laws are better than ours. The superintendent was a highly educated man; he asked no questions but made his observations and stayed a couple of hours and went out and told the supervisors in that district that the school was the best school in that county outside of the village of Owego.

Now that is just the case with the institute workers and the farmers of Pennsylvania.

I wish to divert your attention from the State Board subject. I wish to call your attention to the question of having men go out as instructors in whom the people have confidence to believe they can instruct them. In my judgment that is important, if we are to obtain the results desired.

Now, gentlemen, the attainment of success in the institute work is not a question of the dollars and cents paid for a hall, or for a band of music, but it is a question of the quality of your teachers, and a question of the impressions which they leave and of the importance of their instruction.

I drew the line eight years ago—I have been in this work for some fifteen years, and I drew the line—I would not go into a cold room under any circumstances. I have lain within three feet of a hot fire in a bar-room to avoid a cold room, for as I said, I will not go into a cold room, and I can stand thirty degrees below zero because I dress accordingly, but when ten o'clock at night comes, and the speakers have passed through their meetings of the day in a strong effort to leave an impression that is of value to the farmers, and then when they go to their stopping-place to remain over night, you can judge about the condition they are in. Give us a warm room, a warm hand and a warm heart and we will do our best in whatever work we have to do.

We have got to inform ourselves during the season, and be prepared for it. You are all wide-awake and the men who come to you as instructors must be wide-awake.

Now, gentlemen, from the incipency of this enterprise there has been great progress made. I can recall when I have been driven away from a church door in places where institutes were appointed to be held just because of the prejudice of the people in that locality; they thought we were a humbug. Those prejudices have been dissipated by the force of the arguments presented, and the importance of the facts brought home to the farmers, showing the conditions which must be met. They have been impressed by the truth as it has been presented, so that now they value very highly the work that is being done for them along this line, so that now where appointments are made all over the State, they are anxious to receive us. I think my five minutes are up.

MR. RODGERS: Mr. Chairman, I move that the order of the day be taken up at 10:30.

The motion having been duly seconded and the question put, it was agreed to.

MR. McHENRY: Mr. Chairman, I have listened to these remarks here and I was very much pleased with some of them, and I want to give just a few words of my experience. I have found when I

had committees assisting me to make programs and to run the institutes, that I have always had to go down in my pocket after the expense account was rendered, when I had finished up. For three years I have had nobody to help and have attended to the business myself and I have never spent quite all the money allowable but I have had the luck to get churches, paying the janitor for cleaning up in many instances.

Now I believe this, that we want more brains put into the arranging and the running of our institutes, rather than more money. It is brains we want; I do not mean that I have those brains at all, but the idea I wish to convey is, that it takes a deal of arrangement and management, and that arrangement you must commence when your June meeting comes, and follow up to the very nights of the institutes, not a let up, if you want a success. I do not say that I have had a success in my county; that I will leave to the lecturers who have been there. I do say this, I have had no trouble in getting up my programs, and my papers have always done this. I would manage some way or another to get them to publish my program, which usually costs me from seven to ten dollars. Every paper in the county would publish that program in detail, put it from column to column; that was my advertising; besides that, drawing the attention of the people to it every few weeks beforehand, sometimes six weeks or two months before, keeping the fact of the institutes before the people, and advising them of what was going on, keeping it to the front, and with the posters which were put up all over the county, my advertising has been effective; I have had no trouble in that way. My great trouble has always been to get a place for those speakers, so that they would not be obliged to go into a cold room after talking for an hour or two or for the whole evening, and then go into a cold room, as cold almost as ice, and there is the trouble. Take my own county and I venture to say this, that it is the same with many others, and we haven't got a good hotel outside of the county seat, and I guess, include the county seat and not be far wrong. Now what are you going to do? They have no warm rooms, no rooms heated at all. Many times we have got to go to the farmers' houses.

The DEPUTY SECRETARY: Haven't you got a lot of coal out there?

MR. McHENRY: Yes, any amount of it, and they will let you dig it yourself if you want to, but the question is, how are you going to heat up a room? No fireplace, no stove in it. I have had them heat irons and bricks and all those things yet it does not accomplish the heating of that room, and this is a matter which has given me a great deal of trouble.

I like one idea that has been brought forward, and that idea is one of the questions before us here, presented by Brother Martin. I think that we want our counties organized in these societies, not so much for the money that it may bring, as because it will arouse our people and bring them together and when they get their heads together we will get better work done, and more concentrated work and more united work, and we want to get our whole people interested in these institutes.

MR. HOOVER: Mr. Chairman. I have been listening to this discussion with a great deal of interest. I belong to that class of workers called Farmers' Institute Managers and also take a part in trying to instruct farmers as to a better and higher mode of farming.

While I agree with all that you have said, there are still a few things that I think are worthy of our consideration, and one is that I think our institute managers should be men who are successful in their vocation themselves. If you want those to whom you preach your doctrine to have faith in what you say and what you preach, you ought to be able to show it in your own work. A man who cannot point back to his farm with some pride, or at least with some idea that he has set his standard high, or anyway a little above the ordinary, is hardly the man to be an institute manager, because it is a rule that the doing of a thing always has more force in it than the mere preaching of it. You must show what you can do. You must not only preach, but you must practice. If a man's work does not bear him out, he is a poor leader. That is one of the important features, as I think, to be considered by institute managers and workers. He must teach not only in the lecture field, but on the very farms as well, in order that persons who are prejudiced, who are indifferent, will see a forcible presentation of the argument made, much more so than he can bring before them in words, for if they see it exemplified right on his farm, it will be an object lesson far beyond any mere words.

I have known a number of cases of men who were leading men who stood by me in my work in my own particular county, where there is still a good deal of prejudice and indifference, they have stood by me showing results on their farms and in that way they drew in some of those indifferent persons who had failed to attend their institutes and who had looked upon our work as a species of humbug. By these practical means, those prejudices have been removed, and progress has been made, and more successful methods of farming have been taught, and you know we want to have better farming and higher farming; that is the main purpose of our organization. These are the things that occurred to me as things that are well for us all to take home and consider.

MR. SEEDS: Mr. Chairman, one of the gentlemen who has addressed you, has spoken about the great trouble the county chairman has to get a suitable room and accommodations for the speakers. I will acknowledge that it is all right during the day when his institutes are going all right, and he has got a good crowd that stands by him and he feels good until he goes to the quarters for the night and gets into that cold, dismal bar-room, perhaps heated with an oil stove that warns us of future punishment. That is what breaks an institute worker's heart and makes him homesick and he wishes he was home.

I have not got much complaint to make as I have nearly always got the best in the land and in the community, yet if you have got a cold room, I would say this, at least get the people to air it. The coldest room in the world is a room that has been closed up. Let the air in and go in about three hours before bedtime, and try to heat that room up. I have got into bed clothes that were fairly

damp because the room probably hadn't been aired for six months. Now an oil stove is the meanest thing to heat a room with that can be found. I would sooner have a lamp, one of those sixty-horse power lamps.

Now that is the only complaint I have to make. I generally get the best of treatment as I go from one place to the other, and the county chairmen are doing better and better every year. Six years ago I used to go up to the hotel or store in a town, and they said to me, "Why do you leave the institute?" Well, the reason was that I sat there and listened to some man's speech until I couldn't stand it any longer. Now you know they used to call me a big liar, but to tell the truth, I haven't had a man call me a liar for years, which shows the progress that is being made in agriculture in Pennsylvania. I went right down here in northwestern Pennsylvania and covered the ground that I covered six years ago, and I know that the institutes are getting better, and we are moving along and improving in our work every year.

I want to say to the man on the platform who is using his voice, use water externally, internally and forever.

MR. RODGERS: I just want to say that this institute work depends largely on the institute manager of the county just as much as plowing depends on the man handling the plow. If the institute manager is well fitted for his place and has the confidence of the people, he can control the institute work in his county and make it a success. I have had the honor of being institute manager of our county for twelve years, and I refer you to Deputy Secretary Martin or to the figures of the Department of Agriculture of the Commonwealth, and I have never yet spent the money allowed me for the institute work in our county. We have had good institutes and good lecturers and they have been well cared for. I have control of the whole management with the assistance of men that I know in the different parts of the county. I draw them to me; I consult with them. I begin with the June meeting and I do not quit until the last meeting has closed of our institute work. I get quite a good many of our local men to take part in the work. Our program is loaded with local men. We want to get out the young men and the ladies. We want to get out everybody that we can get to help, and to get them to feel that they are doing the work. I don't make a speech; I don't talk as much in my institute as I have said to you since I have got on this floor.

In regard to printing, I get it all done at once place and I get it done cheap, and have saved money every year since I have been at it.

I was the first chairman of the first institute ever held in our county, and the last one, too; it depends on the men who manage the institutes just as much as it depends on the men who hold the plow.

MR. BOND: Mr. Chairman, I want to say a few words on the question of accommodations for lecturers, and the criticisms which have been made as to cold rooms, etc. I would like to know if we are a lot of hothouse plants that have got to be nursed like a tender plant or an invalid infant. If we are, let us stay at home and not go

out. I am tired of hearing this line of talk, and I say let us stop these criticisms.

MR. HERR: About three weeks ago the chairman here asked me to prepare a paper, which I did, on the requirements of the institute worker. Now I want to say a little bit about an institute manager. My friend Rodgers touched the subject very nicely. He has been an institute manager for many years and is one of experience. I will also add that I have conducted all the institutes held in our county and they were among the first held in the State.

The institute manager is as important as the speakers are in the success of that institute. He ought to be a man of attainments and he ought to know something about human nature. He ought to be a leader among the people, whom the people look to with respect, a man of standing, a man of character, and a man of influence. He ought to be a speaker of sufficient force and distinctness to be heard all over the room. The institute manager that gets up and makes announcements that cannot be heard all over the room is a misfit as an institute manager. I remember being introduced on one occasion something like this: "Now, Mr. Herr will make his speech from Clinton County." You want a man who can foresee any local difficulty that is likely to come up. He must be a self-possessed man and not get mixed up. He must be a parliamentarian, and one who don't get rattled and mixed up because there is nothing like the fun for an audience if the presiding officer gets mixed up and don't know where he is.

There are occasions when some man is going to bore you perhaps with a long speech or something that is not of interest to the audience. Now there is a very mild and nice way of dealing with such men, and there is also a way of insulting them, and such a situation requires tact and careful handling, and if you have it you can prevent a whole lot of trouble in that line. The chairman should be a man who is firm and courteous to everybody in the audience. He must not be like that man whom my friend Agee once told us about who, when a speaker was occupying too much time and boring the audience, said to him, "Dave, Dave, my God, sit down, sit down, shut her off!"

Another important qualification of an institute manager is to be able to comprehend what is going on and to know whether it is practical in the community in which he lives, and when misstatements are made—many a time false instruction goes out that is not applicable at all to the place, and if a speaker gives such instruction, it ought to be promptly corrected. It ought to be corrected before people are led in the wrong direction, but the one great qualification, I might say the first and foremost, is that a man must have his heart in his work.

MR. NELSON: Mr. Chairman, one of the most important things we have on hand here to-day is to find out how we can get more institutes. Our county has been successful in increasing the number of institutes. I will introduce here a new member of the State Board of Agriculture, who was present at the society meeting last year, who will tell you how we raised the money for those extra institutes, that is Brother E. M. Davis, of Grampian.

MR. DAVIS: Mr. Chairman, I am not a public speaker but I am an awful worker. We have in this county an agricultural society which I was president of, and we held twenty-four days of institutes in this county, and I believe they were all a success. We have in our constitution of our county organization or agricultural society a clause that 25 cents makes a member for one year. We districted our county into twelve districts with the idea of holding twelve institutes of two days each but we held only ten. I said to them that if you will raise a minimum of seven dollars and a half by 25 cent membership fees, we will take that \$100 to the Commissioners and have it duplicated, and it gave us \$200 to run the twelve institutes which we accomplished last year very successfully. Brother Martin was with us for two or three days, and Brother Northup for two weeks; outside of that we did the whole work with our local help; the State did not supply us with one speaker; we can do excellent work among the farmers with our local help. I always feel that the local help should be encouraged, because it is cheaper than to get this foreign help. That is about all I have to say.

Time being limited, several members of the Institute had no opportunity of expressing their opinions in the general conference. Two members, however, have submitted their ideas in the two following papers:

ADDRESS.

By W. H. STOUT, *Pinegrove, Pa.*

Not long since a delegation of farmers from my neighborhood went on an errand of investigation to see the home practice of a number of the State speakers who made rather extravagant statements at institutes of their practices and successes, and if I might repeat what was reported in detail, it would not make a very creditable showing. The conclusion arrived at was that they would not go any distance to learn from them, having more practical and better work near them in various lines of farming.

Pennsylvania farmers have the reputation of being leaders in their pursuit, and anticipating Horace Greeley, numbers went West early, in Conestoga wagons, across to Ohio, where they introduced their thrifty and industrious habits, so that our border state has some very good farmers, taught by farmers from the "Keystone" State of agriculture, and it is not the one state only, but many others all the way to the Pacific Ocean, and the Southern states as well, received lessons and inspiration from the sons and daughters from the farms of this State.

As westward the empire made its way, the East was neglected so we hear and read of abandoned farms, and neglected agriculture in some of the Eastern states.

As educators too, we lead, as evidenced by the fact that our institute speakers are in demand in New Jersey, New York, Maryland, Virginia and Ohio, showing conclusively that we are entitled to the credit, justly merited, of being at the head of the procession.

Possibly rate regulation has an influence in getting up railroad

outfits. Perhaps patriotism or policy may induce officials to generosity, and while it may, for certain sections, be appropriate, we at home need to look after the rural districts, the backwoods and isolated sections where trolleys carry no freight, and limited trains no intelligence.

The average farmer who belongs to that great primary class in less favored localities, on poor soil, and the tenant farmers, so numerous in the most fertile valleys, need instruction, example and inspiration more than those near the centers of industry and main lines of travel, where improvement, progress and intelligence are in the air.

Possibly my scheme to make the work more effective and bring it home to the indifferent farmers, may meet approbation, so I will outline a plan entertained in anticipation of receiving the appointment of Director of Institutes.

The schoolhouses throughout rural communities are standing vacant during the summer months, and to engage lecturers to go from one to another every evening during the week, and program the itinerancy in advance, sending three into each district to succeed each other alternate evenings and make their way from place to place on foot, in the meantime studying the topography, geology, crops suited to various localities, gather specimens of insects both beneficial and injurious, the characteristics of the people, explain to them on the fields the best methods of cultivation, applying fertilizers, how to use manure, show them how to milk cows, use the separator, make high-class butter, determine a balanced ration from the material at hand without having reference to purchased stuff, like dried brewers' grain, cotton-seed meal and hulls, and in a general way suggest methods of improvement, are a few of the duties devolving on the coming institute worker. It can be accomplished economically by traveling, as the San José Scale is said to do, and by boarding around like the earlier teachers used to do, it will be both practical and economical.

In order to give more publicity and dignity to the undertaking, a body now in the employ of the State, who do not know what to do with themselves, and the authorities as little, can be engaged to maintain order and ride around distributing programs, extending special invitations to whoever they meet. This has reference to the body known as the State Police or constables. This is only a rough sketch of the scheme, as the time allotted is too short to go into detail, which can be worked out later on.

Trimming trees, general orcharding, building economical and sanitary barns, refrigerators, stock breeding, marketing, general sanitation, hygiene, good house-keeping, bee-keeping, and explaining economical matters, are some of the other features that might well be included in the curriculum as occasion demands.

Subjects must be condensed so that each speaker is limited to three hours and is not permitted to taffy the county chairman or the women, and telling stories, unless they are true stories, will not be permitted.

ADDRESS.

By MR. HORACE SEAMANS, *Factoryville, Pa.*

"The Local Organization of Institutes."

We are told by one of the greatest lexicographers of this or any other land, that organization is the act of forming or arranging parts of a compound or complex body in a suitable manner for use or service, and certainly the organization of a local institute is sometimes very complex as far as my limited knowledge extends.

At the city of Scranton, in our county, is a Home for the Friendless. A childless couple went to this Home recently and adopted a five or six months' old baby and started for their home with it. They had not gone far when the wife says to her husband, "Here, John, you take the baby; I must go back and ask a question." When she had found the matron she asked, "Was the baby's parents Dutch, for if they are and the baby talks Dutch, what a dreadful fix we will be in, for neither John nor I know a word of Dutch?"

Even so with the organization of our local institutes. We must talk of what we know and know what we talk about, or we will be in a dreadful fix, and our speakers must talk on subjects that are of local interest, and it is essential to our progress that we interest the young farmer and induce him and his wife to attend the institutes.

There are sometimes unusual occurrences. I have in mind an institute held in our county in December, 1904. Our local society had appropriated a sum of money for music, and our institute manager (H. W. Northup) had engaged the services of a noted singer and his niece, but for some reason the singers did not arrive at the proper time.

In opening that evening's session, our manager stated with pain perceptible in his face, that we would all be disappointed, as the musicians had not arrived. At this moment he was called to the door and soon returned with a smile on his face, such as only Henry W. Northup can wear, and announced in a good voice, that we would have music, as Mrs. Krebs and her relatives had kindly come to assist. This music was excellent with frequent encores. One piece was a medley with just a touch of Yankee Doodle in it. The pastor of this church was absent that night, but he heard of Yankee Doodle early the next morning and finding Mr. Northup and myself, he told us very plainly that his church was not for Yankee Doodle, and that we could not have it again if such music was to be heard there. Of course we both apologized, but said we saw no harm in the music; if any one was to blame it was our local member who had invited Mrs. Krebs and her friends to come, who was also a member of that church.

Next night I was chairman. Mrs. Krebs came again but was met at the door and told that her music would not be allowed. She came to me and stating her case, asked to be allowed to make a few remarks during the evening. I consented, and later called upon her. She gave a short history of Yankee Doodle and said she had played that medley in the churches of the larger cities of the United

States and there had never been any criticism of it before, and finally said that the good people of that village would never be troubled with her music again. She was cheered all over the house. The pastor came to me at once, and asked why I allowed that woman to talk. I answered that I supposed that she had on oration; at least she did very well. Some one made a mistake, or was opposed to the organization.

The same year we had Brother M. S. Bond with us. You all know he is a potato talker and a potato grower. In one part of our county the principal crop is potatoes. We opened our institute there the second day at ten o'clock and Brother Bond was the first speaker. When his time was up, questions were being fired at him from all over the church, and he kept going till time to adjourn for dinner. He didn't stop there; the audience would not let him. The dining-room was in the church and questions were fired at him all through the dinner hour, and then there were those that wanted to hear him some more.

This might be called a successful organization of a local institute.

The CHAIRMAN: The hour has arrived for the order of the day, and the Committee on Resolutions, as I understand, are now ready to present their report.

MR. McCREARY: Mr. Chairman, as Chairman of the Committee on Resolutions, I will call on Professor Menges to read the resolutions.

REPORT OF COMMITTEE ON RESOLUTIONS.

1. Resolved, That we, the Farmers' Normal Institute in session, May 29th to 31st, 1906, in Clearfield, Pa., desire to express our hearty appreciation of the courtesies extended to us, first, by the county chairman of Clearfield county, Hon. J. W. Nelson, in inviting us to meet here, and in making good his promises for our comfort and pleasure. Second, to the County Commissioners of Clearfield county in granting the use of this court room. Third, to Hon. A. O. Smith, judge of the Common Pleas Court, for adjourning his Court in order that we might have the use of this room for holding our sessions here. Fourth, to the newspapers of Clearfield for advertising and reporting our meetings. Fifth, to Hon. N. B. Critchfield, Secretary of Agriculture, and the Hon. A. L. Martin, Deputy Secretary of Agriculture, for their thorough and complete arrangements for bringing us together with the State Board of Agriculture, and for the pleasure of hearing the distinguished specialists they have brought here from a distance to instruct and entertain us.

2. Resolved, That we cordially welcome the announcement of the plans for a Farmers' week at the Pennsylvania State College during the coming Christmas vacation for the purpose of discussing the modern method of seed selection, stock judging, butter scoring and other important matters of farm practice. That, in view of the high practical value which such work has shown in other states, we bring the plan for a Farmers' week to the attention of the farmers of our neighborhood, and urge them to avail themselves of the advantages it offers.

3. Resolved, That we appreciate and deplore the difficulties that lack of funds brings to the Board of Trustees of our State College, and we pledge ourselves, and earnestly urge all agricultural organizations and all individuals who are interested in agriculture in our State, to use all honorable means to secure adequate appropriations to enable the Board of Trustees to bring the agricultural branch of our college up to as high a state of efficiency as is now enjoyed by the Mechanic Arts branch.

4. Resolved, That it is the desire of the members of the State Board of Agriculture and the institute lecturers of the State of Pennsylvania, and that we recommend that the Legislative Committee ask for an appropriation to be used by the Department of Agriculture to pay the services and expenses of competent persons to instruct the shoeing smiths of this Commonwealth in their vocation thereby preventing the many serious diseases commonly brought about by the lack of knowledge on the part of the shoeing smith, which would be a great benefit not only to the shoeing smith, but to the horse owners and the farmers throughout this State.

5. Resolved, That we suggest that the State Breeders' Association and the State Dairy Union hold their meeting at Harrisburg during the same week that the State Board of Agriculture meets in order to save time and expenses of those who wish to attend any or all of the meetings.

6. Resolved, That the township laws relating to roads, etc., should be codified and published in such form as the school laws now are.

7. Resolved, That we demand such legislation as will make electric railroads common carriers, and that they be given the right of eminent domain the same as the steam railroads.

8. Resolved, That we insist on liberal legislation and appropriation looking to the completing of a system of macadamized highways in this State.

9. Resolved, That we heartily endorse the great public movements now in operation in the exposure of graft, in all its devious forms, and that we pledge ourselves to sustain this effort until graft shall be banished from government, corporate and public institutions.

10. Resolved, That we favor the passage of an Act providing for voting upon questions of public policy for an expression of opinion, if ten per cent. of the voters for Governor at the last previous election shall so petition.

11. Whereas, In view of the fact that from numerous sources all over the State have come demands that the agricultural interests at this time of uncertainty, make the same requests as do other organizations for recognition in governmental office, and in view of the further fact that not since the adoption of the present constitution has a representative of the agricultural and business interests occupied the gubernatorial chair, and further recalling the successful and untarnished record for six years as a member of the Legislature, when, as Chairman of the Agricultural Committee he rendered most efficient services, and further remembering his career of seven years as Deputy Secretary of Agriculture, where with untiring energy he has so organized and administered the farmers' institute system of Pennsylvania as to make it second to none in this country, and believing that he would draw to his support the agri-

cultural and business interests without regard to party affiliations, and that in harmony with his previous record, he will administer the duties of the executive office of this State with honesty, efficiency, and to the best interests of all parties, therefore be it,

Resolved, That it is with pleasure we note that calls are coming from various sections of the State that Hon. A. L. Martin become a candidate for Governor, therefore, we most heartily endorse him as the candidate of the agricultural interests of the State.

These resolutions unanimously recommended by the Committee.

(Signed.)

SAMUEL McCREARY, Chairman,
FRANKLIN MENGES, Secretary,
T. E. ORR,
MATTHEW RODGERS,
AMOS B. LEHMAN,
D. A. KNUPPENBURG,
M. N. CLARK.

The CHAIRMAN: The resolutions are before you; what is your pleasure?

It was moved and seconded that the resolutions be adopted as read.

The CHAIRMAN: You have heard the motion; are there any remarks?

MR. AGEE: Mr. Chairman, I want to say that I am very glad that the resolutions refer to the needs of the State College. The trustees of the State College I know propose to develop the agricultural end as much as the engineering department and mechanic arts. It is in the hands of the farmers of this State to do it.

Now I know that some of us have felt in the past that we have not had at our State College as full recognition of agriculture as we should have. It is within my knowledge that the executive committee are determined that the agricultural end of the college shall be developed, and I want the support of the farmers of this State for that week. If we have a farmer's week at State College I hope you will make an effort to attend and you will give an interest to that meeting, and to the work of popularizing agricultural education. We are not working just for this generation, and unless you people in your institute work teach the boys in our homes, give them better instruction than we received, these institutes will not have done one-half the work that they should do.

Professor Van Norman told me that they are hunting the United States over for the most distinguished specialists. They want to get men like Professor Holden, of Iowa there during that week, and have a talk on corn breeding, and similar men all along the line in other departments. Let us advertise that week, and get our Pennsylvania farmers interested. I say that because I feel that I am at least part Pennsylvanian; get the people in the audience interested and let them go up there, and if you do that, you will get a greater influence to bear upon the trustees of the institution, and I want to say to you that good men are going to be brought in, and in five years from now, State College is going to be a leader among the agri-

cultural colleges of the nation. I hope you will advertise Farmers' Week all over this Commonwealth, and let us take a new start and let us make the State College the great institution it should be.

THE DEPUTY SECRETARY: Mr. Chairman, I have listened with great interest to the resolutions that have been presented for our consideration at this time. The one resolution, my friends, referring to the last seven years of farmers' institute work in which mention is made of the work accomplished and the confidence therein expressed and reposed in whatever part I have borne with you in that work, is esteemed and valued by me more than all the other resolutions or than any resolution that could possibly be presented, for, my friends, the man who undertakes to serve the public to-day in Pennsylvania is a failure unless he has the whole, heartfelt confidence of the people in whose interests he labors and I esteem that expression over and above all others.

Mention has been made of the highest office within the gift of the people of Pennsylvania. For many years I have been impressed with the thought that agriculture, the base upon which every other industry and occupation and business rests to-day ought to be represented in the highest position, and while I believe that the interests of agriculture are entitled to such representation, I have not dreamed nor do I dream now that my personality can enter into view in that connection.

As you are well aware, my friends, conventions nominating and presenting names for the governorship are already partly consummated; one is held to-day, another next week, and another a few days later. You are aware of that, and that delegates are already elected, therefore I take it that the resolution in question is scarcely intended for more than the presentation of an expression of your will upon this point and question.

For the past many months questions of this kind have been presented to me and I have repelled them and have not considered them, but I want to thank you for the honor you have conferred in presenting my name. I shall go away bearing with me the recollection of your kindness and confidence as shown by the expressions in these resolutions.

MR. HERR: Mr. Chairman, I would like to emphasize one of the resolutions you have heard read, and I would like to have our people aroused to its importance a little better than we are, and that is for the maintenance of State College. I said something about this on Tuesday morning but I know there are many here now who were not here then. Speaking for the trustees, several of whom are present, and they are all of one accord, I want to say that they are doing all they can in the way of advancing the agricultural end of the college, as my friend Agee has stated, but if we are to do it we must have something to do it with, and it is up to you as influential citizens all over the State to see that we shall have these funds.

We want to elect a Legislature which will consider the claims of State College and give us maintenance funds. Maintenance funds which sufficed two or three years ago to care for two or three hundred students are not sufficient to care for a thousand students which we have, or will have in the very near future, and the appropriations that we have received from the State have been so specific

that we could not use them for maintenance. We need an appropriation which shall not be specific, but for general maintenance, and large enough to meet the need, and then we will bring up this agricultural end, and place it where it should be.

Then we want to elect a Governor who will not cut the appropriation in two and give us only the half of it. Only give us the material that we need to work with and you can depend upon it that we will do the very best we can for the agricultural community.

MR. KAHLER: Mr. Chairman, I know that it is customary in nearly all associations to present resolutions. They are presented and adopted and that is about the last of them. I think the time has arrived when if we express our sentiments through a resolution, it should mean something. We generally embody in that resolution what our wishes are. I think you will all agree with me that nothing can be effected in the legislative line in the interest of the State College or in the interest of reform in any way, unless you create a sentiment for it. Now how can we do that? I think it is up to us, as has already been said, and that the time has arrived in agricultural education and in many ways that we make manifest our wishes and desires and give the State to understand that we mean it.

Now in this association, with representative men from nearly every county in this Commonwealth, let us not just merely direct the adoption of this resolution, but let us create a sentiment at home, and I tell you that the politicians can't withstand the sentiment behind it. There has been nothing said or done here on a partisan line; we have had a confounded sight more partyism than we have had of wholesome laws. I am for the man who will stand for us, I don't care what party he represents. I want to know what he is.

MR. BRODHEAD: Mr. Chairman, I would like to ask how many men in this audience own horses. Hands up. (Many hands were lifted.) I wanted to get this vote for information. I am traveling over this State and some others and I have found that the horse-shoeing interest is retrograding. The horseshoer used to be a power in his neighborhood. There is another thing I want to know. I want to know how many men here know of men learning the horse-shoeing trade under twenty-one years of age. (Three or four hands were raised.)

I was in fifty-four shops in the State of New Jersey a year ago last winter and found only three solitary men learning the trade. I haven't found a man in two years trying to learn the horse-shoeing trade. Our business has been brought down and our fellow-craftsmen have lost their interest and only learn by what they pick up here and there. There is not a place in the State of Pennsylvania where a man can go and get any anatomical knowledge to fit him for the business of horseshoeing whatever. We have to pick up just what we can. I have tried to get State College to take this up and give our young men an opportunity to get an anatomical knowledge of the horse's foot and leg.

I hope that this resolution, when it goes before the legislative committee—I hope they will do something to better our condition and better your condition. The day is not far distant when men

who own horses will have to do their own horseshoeing if they want it properly done, and they will have to learn how to do it.

I thank you for your attention and I hope that we may have something done to better the condition of the horseshoers of Pennsylvania and the surrounding states.

MR. FENSTERMAKER: Mr. Chairman, if you want your farms all cut up just make common carriers of the trolley roads and give them the right of eminent domain. That is the reason why I am opposed to these resolutions covering that point.

MR. HERR: Mr. Chairman, I move that Mr. Brosius be given the privilege of the floor.

The motion being seconded and the question put, it was agreed to.

MR. BROSIUS: Mr. Chairman, I simply wish to speak for a moment upon this railroad question. The trolley has come to us and it has come to our farms, and it has come to stay. The trolley is to circle our valleys and climb our hills and the steam railroad never can come that way. A steam railway can never be brought to our farms. To give the trolley roads the rights proposed may injure some individuals, may injure the feelings of some people who own the farms and homesteads, yet for the good of the whole, we have given steam railroads the right to divide our farms and go everywhere in the State except in your homesteads. More people will be benefited by trolley railroads than by steam railroads, and they ought to have the rights which will enable them to efficiently perform the work necessary for the good of the whole people.

I do not want to go upon record nor have it go upon record from this institute that we are opposed to eminent domain for trolley railroads, because I think they ought to have it.

The chairman stated that it was important that a part of this period be divided and the period following and requested Mr. Glover to come forward and take the chair.

Dr. Conard stated that there was a course in horseshoeing in the University of Pennsylvania.

Mr. Glover took the Chair.

Prof. Menges asked leave to amend the resolution relating to horseshoers so that it might not be in conflict with existing facts.

Leave was granted and Prof. Menges, as Secretary of the Committee on Resolutions amended that particular resolution in conformity with the understanding arrived at, being authorized so to do by the motion of Mr. Hutchison, duly seconded.

The CHAIR: We will now take up the first number on our program, which as you will see is, "On What do the Dairy Profits Depend?" By Prof. H. E. Van Norman, Department of Dairy Husbandry, State College.

Prof. Van Norman read his paper as follows:

ON WHAT DO THE DAIRY PROFITS DEPEND?

By PROF. H. E. VAN NORMAN, *Department of Dairy Husbandry, State College, Pa.*

The profit in a business is the difference between the cost of production and the price received for the goods produced. It is the proportion of the selling price which may be used for enlarging the business, or it may be paid to the stock holder, or proprietor as dividends. Without exception, all our large and successful manufacturing concerns maintain a considerable force and spend no little money to secure exact information as to the cost of manufacturing, handling and selling their goods. In many lines the margin of profit is so small that a variation of a few cents in the cost of production means immense loss.

I believe there is no business which will stand the losses and leaks that most farm business establishments suffer and still yield the owner a living. If with a reasonable outlay of time, labor, and even money, and considerable proportion of these losses could be stopped, and the profit proportionately increased, many farms which now yield their owners a bare living would show a profit to be used for the good things of life, the luxuries, comforts, and travels or entertainment.

My first point is, the dairyman should know what his cows are producing in return for the feed consumed. Statistics show that the average production per cow in this State is about 160 pounds of butter per cow per year, which little more than pays for food consumed, while Experiment Station figures, commercial herd records, and many investigations carried on among creamery patrons show herds that have produced from 225 to over 300 pounds of butter fat per cow per year. In one community, Experiment Station figures showed that 68 out of 100 farmers did not receive as much for the product of their dairy herds as they could have received for the food consumed had it been sold at market prices, while the remaining 32, by the use of silage, clover hay, better grain mixtures, care of the manure, attention to blood lines and the reading of dairy papers, secured a handsome profit over and above the value of foods consumed.

There is not only a large difference in the production capacity of different herds, but even a greater difference in the production by individuals in the same herd. One cow will produce from 90 cents to \$1.00's worth of milk for each \$1.00 worth of grain, pasture, and roughage, while another will consume practically the same amount and return from \$1.50 to \$2.00 worth, and, in some cases, even more of milk or butter. Some of the profits from a good cow must be used to pay for the losses on the poor ones, thus reducing the profit per cow very considerably. It is this great difference in productive power of different herds, and still more important in different cows, in the same herd that makes it so important for the owner to have a definite knowledge of what his cows are doing. The fact of this variation has been proved over and over. Confirmation of this statement may be found in Bulletin No. 75, B. A. I. of the U. S. Department of Agriculture.

If we accept this fact of variation "in productive power," how shall the ordinary farmer determine the yield? It will pay any man who is milking cows as a business to weigh the milk of each cow at every milking, but most men won't do this. It will pay because most milkers will strip enough more carefully to more than offset the time required for weighing. If the yield was down one-fourth of a pound or one-half pound at the preceding milking the milker will unconsciously give a little more attention at the succeeding milking, prompted by the scales that may be he did not do his work as well as he should the last time. It will pay because in no other way can the owner know definitely that each cow is doing as well as she should do, especially if he is not doing the milking himself. By means of the milk record he may discover the evidence of careless milking, and the failure of certain cows to do what they should; oftentimes this information will enable him to correct a fault and maintain a yield that will amount to a good many hundred pounds additional in a year. This is a feature of the daily record which is usually overlooked by the men content to weigh occasionally.

Recognizing that many would like the information but are deterred from keeping the daily record by the apparent amount of labor, the next best thing is to weigh the milk for seven consecutive days every seventh week, seven times during the year; this will give a very close approximation of the amount of milk produced, but will be of little value to the man who is desirous of securing the largest returns for feed consumed from day to day. If the market product is butter fat it is necessary to test the milk and know how much fat has been produced. In addition to the pounds of milk produced he must know the per cent. of fat in the milk. To secure this, procure a sample bottle, pint milk jar or fruit jar, one for each cow, in to this place a sample of each milking for seven days the same week the milk is weighed, or if weighed every day, every seventh week. With the weight of milk and the per cent. of fat for definite periods regularly throughout the year, it is but a matter of figures to know the production by each cow.

Some prefer to weigh and test the milk three days, only, each month. I prefer a longer period of seven days every seventh week, because the longer the record period the more apparent the daily variations, and the fewer times in the year will the occasional work of testing need to be done.

Most men are satisfied if they can guess pretty near to what their cows are doing. When a very successful dairyman, and president of a State Dairy Association, began the keeping of a milk record of his herd he recorded his guess as to which was the best cows 1st, 2nd, 3rd, 4th and so on. At the end of the year the one he had guessed first actually ranked 4th and the one which held first place he had put fifth in his guess, at the beginning of the year, while his second guess occupied 6th place in actual production. Records from many states show man's inability to guess accurately and therefore the need of positive records to secure definite knowledge.

While there is a difference in the value of feed consumed by different cows in the same herd, this difference in most herds will be less than \$5.00 and will rarely exceed \$10.00, yet the returns from the different cows in the herd will vary from \$30.00 to \$80.00, or to state it in another way, \$1.00 worth of feed will produce less than

\$1.00 worth of milk from one cow, while in the same herd another will produce more than **\$2.00** worth of milk.

In Denmark, associations have been formed in which the farmers co-operate in employing a man to test their cows, weigh, feed and secure this information for them. Michigan is the first state in this country to organize Cow Testing Associations, and Canada is following in the same lead. Is it not time for our Pennsylvania Dairymen to take hold of this matter? I shall be glad to render any assistance in my power in the establishment of such associations. I believe our creamery managers could well afford to give considerable attention to the organizing of Cow Testing Associations among their patrons.

Having established the fact to his own satisfaction, that his cows are not as good as he wants, how shall he get better ones? It is impossible and impracticable for most men to sell the herds they have and try to buy better ones. The best plan is to raise them for this purpose. He should procure a sire whose dam has a yearly record for creditable production, if the breeder can show yearly records for several of the sire's female ancestors, this is the best guarantee which the buyer can get, that the offsprings of this sire will be large producers. From such a sire as this, and those cows in his herd which have made good records, he should save the heifer calves, using them to replace the poorest cows in his herd.

It is unnecessary to say that the unproductive cow should be gotten rid of at the earliest possible moment. Yet I have known men to keep a cow to convert **\$32.00** or **\$33.00** worth of feed into manure, and produce only **\$25.00** or **\$28.00** worth of milk. Since manure is usually valued sufficiently high to pay for the labor and care of milking, it is hard to figure any profit in this transaction.

If a number of farmers in the same community will use sires of one breed, the time will come when each having a few heifers to sell, a buyer can procure in a community a carload, thus enabling the farmer to secure more for his heifers than he could possibly have done for one or two if they must be shipped by themselves. I believe this "community of interest" should receive more attention from the farmers in a neighborhood than it does, and lastly the profits will be materially increased if the quality of the product is maintained at its highest, indeed rarely has the market more of the "first" or "extra quality" be it cows, butter, milk, corn, or even men, than the demand, yet there is much of the time an over supply of the next grade lower, and it is quoted as "a drug on the market" or "slow sale."

Uniformity of product from week to week is of vital importance. If the public can depend on a brand of goods always being the same, it does much to insure a steady demand and insures a premium above market quotations.

A Member: I would like to ask the Professor if he has had any experience with the milking machine?

PROF. VAN NORMAN: Personally, no. I saw the American machine at the Chicago Dairy Show, and I saw the Burrell machine where they were milking some sixty cows. So far as I have seen it, I believe that the milking machine is about where the automobile was several years ago. I believe they will be improved and that

they have come to stay. I believe where good men are employed and placed in charge of the machines, that they will be a success.

A Member: They are all power machines that you have seen?

PROF. VAN NORMAN: Yes, I don't know of any small machine that has risen to any general recognition. The machine of the Burrell people has got to that point where it is getting into commercial practice. I know of a number of farmers that have put them in. They are wealthy men, it is true, but they are looking after the dollar.

The disadvantages will be, there will be some cows that will be difficult to milk. A man who will take the precautions that are necessary can keep them clean, and the expense of doing that will not, in my judgment, be prohibitive.

A Member: How expensive are the machines?

PROF. VAN NORMAN: The machine itself to do the work only costs about \$75, and then there is the pipe and you have to have an engine of some kind to get the necessary vacuum and you have to have a pump. I remember one gentleman who figured a cost of \$800 for about sixty cows; it was a good deal less expensive than two men.

I saw a machine milking sixty-four cows in one hour and sixteen minutes, and found thirty-two cows with less than six pounds of strippings. I do not think you can do that with men milking. I found one man who said he had discontinued his strippings, because he got so little.

I don't advise the general farmer to go ahead in the use of these machines at present; let the other fellow experiment a little longer.

A Member: I understand that Mr. Billings is operating a milking machine, and I would like to hear from him.

MR. BILLINGS: Mr. Chairman, we are trying a foot-power machine. We have been operating it for three months. It has been, we consider, a great success with us.

We were having difficulty to get help that was efficient to handle our dairy. We heard of this machine and we ordered two and brought them into our herd and they are doing very satisfactory work, for this reason; a man with one of these machines can do twice the amount of work, and he produces a great deal cleaner article than he can in any other way.

I found one man who had a machine and threw it out because he was not there to look after it himself. Now the machine has got to be looked after, to keep it clean, but it is not difficult if you are right there, and watch it closely.

With this machine, one man can milk about sixteen cows per hour. With our herd, it takes a good man to milk eight cows per hour by hand. You can sit down there and milk all day with the machine the same as you can go on to your farm and do any other work, and you are not exhausted. We didn't know when we went into our plowed fields this spring but that it might worry us a little when we got to milking there, but we are well satisfied and consider that the machine is a great success as far as we have experi-

mented with it. What we are interested in now is, to know whether by continuing the use it will continue to be as satisfactory as it is at the present time.

MR. HUTCHISON: What is the cost of the machine?

MR. BILLINGS: We paid \$65 for it.

MR. FENSTERMAKER: Who is the manufacturer of the machine?

MR. BILLINGS: George Lowe Behring is the manufacturer of this machine. He has been working at this machine for fifteen years. The inventor was at my place and showed us some things about it.

MR. AGEE: Didn't you ever observe that some nervous cows prefer it to hand-milking?

MR. BILLINGS: Yes, that is another point. Some cows take it more kindly than they do hand-milking.

PROF. VAN NORMAN: There are a great many of us who would not milk for twice the income we are getting, and I believe this. When the milking machine is perfected, it is going to make it possible to employ more intelligent men for the work, and we are going to be able to pay a higher price for more intelligent men.

MR. BILLINGS: I would say this, that if you put in one of these machines, you have got to hang to it a little while, or else you will discard it before you know what it is. We had to work something like two to three weeks before we got everything satisfactory. Some of the people who have bought them have discarded them in two or three weeks, simply because they did not stick to it until they knew just how to operate them.

DR. DETRICH: Mr. Chairman, we have looked quite carefully into the milk machine question for other people, but the real objection to the machine is, the jealousy which people have towards the instrument. They don't want to use it. They had a terrible time with the help at Berkley's farm. The trouble is, the men think it is in opposition to their own business.

It is like the mowing machine when I was a boy. You can hardly imagine the opposition there was at first to the use of the mowing machine. If you had a mowing machine, you could hardly get a man in to help you hay under any circumstances. It is the very same with the milking machine. Everything is really in favor of that milking machine. The only thing that I can see is, that cows have different sized teats, and you have to have different sized apparatus to fit these teats—you have to have different sized cups. It is a rather pleasant operation for the cattle. I have seen it put on cattle for the first time and they took it without trouble.

It is a cleaner operation than ordinary hand milking, and the men are neater. One man can operate and milk six cows at a time.

Men who write up the machine, who are aware of this prejudice, say wait a little while, and the prejudice will disappear as it has in other instances, but the trouble is you will find that your men will make objections to it; they don't want to do this and they don't want to do that—they don't object to the machine exactly, but as a matter

of fact they don't want the machine at all, and we will have to overcome that prejudice and show these men that this machine is really for their benefit, and just as soon as we get them to co-operate with the machine, I am sure it is a go.

PROF. VAN NORMAN: How many cows do you milk with your machine at a time?

MR. BILLINGS: We milk but two; we can put on another section and then milk more. That we are going to fix for ourselves.

A Member: In our section we lost quite a good many cows by milk fever, and would it be out of place to ask Dr. Tower or Dr. Detrich to talk on milk fever.

DR. DETRICH: I would like to hear Dr. Conard talk about that. I can give my experience as a herdsman and with cattle in handling that. I will assure you this, that no poor cow will ever have milk fever. If a man has carefully watched his cows for thirty days before the cow is fresh, he will tell you just what your cow is going to be, and until a man gets his cow right down and understand the whole situation, he will have trouble. If you want to be a dairyman, you have got to get down to business, and you must know your cow thoroughly, and if a man does not want to get down to that business and study it until he understands it, let him quit the business.

There are other diseases as well as milk fever, that will demand the attention of the dairyman. Milk fever always comes from careless feeding. You get a fat cow, if you take care of the cow and feed her with the right kind of feed, you will have good results and plenty to go into the bucket. If you handle your cow properly and keep her on proper food, she will come along all right, but you must have an eye to know the cow. A man has got to have an eye for the dairy business in order to succeed. It is just like a man trying to play the violin, like Ole Bull. If a man has no eye, just as like as not he will kill the cow.

I don't care what you say about dairying or about handling cattle, a cow must have an udder, and that udder must be filled but you don't want to carry it to excess. When it comes to milk fever, you feed the cow with bran and hay and water ten days before she is fresh, and if she is not making a bag, see that she gets an udder without fail, and then give her a little salt for ten days. Her manure must just be right, for after all, the udder of the cow always follows the manure; if the manure is right, I will guarantee that the udder is right. You can control it to a very great extent just by watching the droppings. You must look and watch every day. Dairying will never be profitable until a man knows how to handle the cow's udder. The whole system must go together. When you have your eye and your hand and your feed and your cow and your weighing machine, then you can commence with the probabilities of success in your favor in the dairy business but not till then.

DR. TOWER: Mr. Chairman, this subject of milk fever is one of pretty broad import. What the gentleman has just said is important, but if we carry this a little further, we will find that milk fever will sometimes occur no matter what you do. I don't believe there

is any rule by which we can avoid milk fever in every case. Now a few years ago we used to think that milk fever was one of the most deadly diseases we had, and so it was at that time. A great many different remedies were proposed; most everything was tried to stop it. We gave them large doses of physic in some cases, and some gave them large doses of aconite and we found that it was the same with this disease as with other diseases. Once in a while a cow would live in spite of what you gave her; I guess that is the way to say it. If a man had a case of milk fever and the cow lived, he ransacked his mind to know just what he gave that cow; then he thought he had a specific and was ready to swear by that in every case. Then a method of treatment came into effect which saved a great many cows. It was thought that the iodide of potash which we injected into the udder, did the business. Now I think that Dr. Conard will bear me out in the statement that it was the air that we injected into the udder that did the work, instead of the medicine. If you get this little instrument that we use for injecting air into the udder and use it in time, and in decent shape, you won't lose one out of fifty.

I know this, I have had within the last two years something like seventy-five cases of milk fever without losing a single case. That is a pretty good record. I don't say it to boast, but I say it for the benefit of the treatment.

A man called me up on the 'phone a little while ago, and he said he had a cow that was very sick with the milk fever, a cow worth a hundred dollars, and he said, "What shall I do?" Then I asked him if he had a bicycle pump. He said he had, and said he, "What are you going to do?" I said, "I want you to give the cow air." He took it as a joke. I told him to take the milking tube that I had left with him a few days before, and instructed him how to proceed to get air into the udder. I don't recommend the bicycle pump in the treatment of milk fever, but I simply say this, if you can't do any better, sterilize your bicycle pump or any other pump and get the air into that cow's udder, but a man who has a dairy is very foolish not to have one of these instruments which are made on purpose for treating milk fever. They can be bought for \$2.50 and any farmer can handle them. I do not wish to take up any more of your time.

DR. CONARD: Mr. Chairman, I agree with every word that Dr. Tower has said, and I was exceedingly glad to hear him say it. Every dairyman should own a pump or a little outfit for the treatment of such cases. It is very important that the treatment be administered quickly. There are some cases, if they continue too long, the poison will become so thoroughly diffused throughout the system that they may not recover; an early treatment is very much the best.

I just want to explain; I think that the Reverend Detrich spoke of feed producing milk fever. I just want to go a little further into that, if you please. I don't quite agree with him without some modification. The feed may produce the conditions which make fever—milk fever—but the feed of itself will not produce the disease. A cow that is well fed with succulent food, bran, ensilage and such food as would produce milk and before the time of par

turation her udder is largely developed, and is producing a large amount of milk. If she is a young animal, that udder is a larger per cent. of that cow's being or that cow's whole body weight, than it would be if she was fed on any other kind of food, if the udder was not quite so well developed, was not so well filled with blood and was not such a good culture medium for germ growth, for I believe we understand that milk fever is the result of the growth of an organism in the milk ducts of the udder which produce a poisonous element which is carried through the system by absorption, so as to become and is, poisonous to the animal, and produces a paralysis. Now if that udder is of a smaller percentage of that cow's weight, if it is not developed so well, her resisting power will be more able to overcome the attack. Suppose that the udder was one-fourth of her whole weight then her resisting force would be as three to one, we might say, but suppose it was one-twentieth part of her weight and the resisting force would be as nineteen to one, so that it is the food that puts the animal in condition to succumb to the disease when it is present; it is not always present, fortunately. As to the sterility of the instrument used, it is very important, and that is the only objection to every man possessing his own outfit, and if he is thoroughly aware of the importance of having everything thoroughly sterile, he is just as competent to do the work as anybody else. I think that nearly all the cases followed by garget are due to the introduction of some poisonous matter into the milk ducts. The milk tube is a very dangerous instrument to use; it should never be used at all without being thoroughly sterilized, and that sterilization should be done immediately before its use. Boil it immediately before using; if it is not sterilized at that time, and sterilize it after using, for you don't know just what may come in contact with in using it, and it is one of the best incubators of disease you can find.

DR. DETRICH: Mr. Chairman, I would like to say one word. "There is such a difference in drying a cow off. You go into a dairy barn and you will say "Is this cow dry?" "Yes, we have quit milking in her." Now to quit milking a cow does not make a dry cow, and that is the very thing that will create germ after germ in that udder. I don't think there is a more reckless thing to do than to carelessly allow one-fourth of the milk to stand in that cow's udder.

I agree with Dr. Conard that the use of a milk tube is a very dangerous thing. You seldom get persons to sterilize milk tubes as it ought to be done. To sterilize is the thing to do, and if you have your boiling water to dip this plug in, and then take it out, and then put it right back into the teat again, with little cosmoline, and dry the cow off without a doubt before you prepare her for motherhood.

If your cow is not dried off properly, you may expect all kinds of trouble. I heard a man say a while ago "you can't milk a cow dry." You give a cow nothing but timothy hay and water and you can dry that cow off. As soon as the cow is dry, commence to feed her. Give her so many quarts of bran a day and so much timothy hay. Watch that cow's system. Give her something cooling. Give her no milk-producing food unless it is really necessary. Use linseed meal; never give her cotton-seed meal. Keep her on a feed of

timothy hay, bran and linseed meal and water, and give the cow as much exercise as you can. Stand back of her and feel her short ribs. No well fed cow will want to walk, but make her walk, and give her the exercise, and I will guarantee you won't have milk fever on the farm.

DR. TOWER: Mr. Chairman, it is quite customary to think that they must do something besides giving this treatment with air; they think they must give medicine. I have known of two or three cases where the veterinary went away after doing what was necessary, and they went and gave them a lot of medicine. In the case of two cows, they both recovered from milk fever, but they died of pneumonia afterwards. After you give them the air, let them alone. If you go to pouring medicine down them, it is just as liable to go on to the lungs and cause your cow to die from pneumonia.

Adjourned to one o'clock P. M.

Court House, Clearfield, Pa.,
Afternoon Session, Thursday, May 31, 1906.

Mr. Glover in the Chair.

The meeting was called to order at the designated hour.

The CHAIR: We will now take up the second number on the program for this morning entitled "Feed, Breed and Care of the Dairy." By Dr. J. D. Detrich, West Chester, Pa.

DR. DETRICH: Mr. Chairman, Ladies and Gentlemen, and Fellow-Farmers: It is a very great pleasure to me this afternoon to stand here and speak to you on the subject of "The Feed, Breed and Care of the Dairy," but before saying one word in reference to this subject, it is my delight to present to you at this time the very splendid address that was delivered by the President of the United States yesterday at Hampton, Virginia, and he spoke of the agricultural colleges, and the work which the agricultural institutes are doing for the farmer, and urged the young men of America, colored men as well as white men, to stick to the farm, and I am happy to be able to present to you this suggestion from the President of the United States, and such good words for the advancement of agriculture, for we know very well that we do not have the sympathy of everybody in the United States, and sometimes we feel that we are pulled down by the tremendous tide that is trying to draw us away from the scientific side and down to the ordinary method of practicing agriculture in the past.

Still further, I bring to you the greetings of Mr. Kates—those of you who were present at West Chester last year will remember him well, and he wished me to say to you, that if you would come to see him again, he thought he could offer you some good milk to drink instead of some of the other stuff.

Dr. Detrich discussed his subject as follows:

FEED, BREED AND CARE OF THE DAIRY.

By DR. J. D. DETRICH, *West Chester, Pa.*

Speaking of the care of the dairy cow, the first thing is, undoubtedly, the feeding of the dairy cow. Of course you have to have your cow before you have to have your feed. We understand that grass was created before the animal, so that we consider that as a matter of course. Afterwards comes breed, second, and the care of the animal next.

There is another phase to this business of dairying which belongs to the handling of the milk and to the marketing of the milk, a question which belongs to the commercial side. You can dispose of it through a milkman, or if you are conveniently situated to do so, you can market your own product. Not every farmer is situated in that matter so as to send his milk directly to the consumer; therefore it is the duty of every farmer to become a business man as well as a dairyman.

FEED.

In speaking for the dairy animal, and believing that the grass was created before the cow, we likewise have to take hold of the subject of the feed for the purpose of handling the dairy business properly. There are several systems that have been in vogue, looked upon as more or less extravagant, and usually conducted more or less on an extensive scale. First, there was the system of pasture, the roaming of cattle out on the plains where there were no fences, and then coming down to the day of fencing and to the keeping of animals within certain bounds, and they have calculated that it takes five acres to keep a cow within the borders of civilization and advanced society. The position which society occupies to-day as regards the variety of the products and its demands has driven the dairyman upward all the time. It will not do to feed the dairy animal on mullen stalks and weeds and all kinds of trash, and then expect her to produce a good product. This animal has to have the very best of food, and to this subject we direct the attention of the twentieth century dairymen who are looking to agriculture as well as to the dairy to-day for a business as well as a profit, and in such a way that they are endeavoring to grasp all the conditions of the question of producing milk and the various stages of its production; and they must not only consider it from the point of view of the dairyman, but also that of the sanitarian.

Well, there were millions of acres of range that animals were permitted to roam over in the past, yet every year as civilization advances and the population of the earth becomes greater, the conditions change. You would think that the dairy animal would be driven further and further away from society instead of drawing nearer to it.

Now as to the question of food, instead of having one kind of food, we have to-day a whole multitude of foods, scarcely an industry opens up to-day that we do not have a benefit derived from it in the way of a by-product. Look at the oil mills to-day, linseed

as well as cotton-seed. They all tell the story of these by-products which are coming up in such a way that they are splendid dairy foods, whether they come from the flour mill, the linseed oil mill or the cotton-seed mill; they put upon the market foods that can be fed to such an advantage that you can continue increasing the milk rather than simply to have a cow that you can milk for a few weeks after she is fresh.

The dairy animal was fitted to give milk so long as she nurtured her calf, but we have succeeded in changing the dairy cow entirely around. You take a cow that is properly handled under modern methods of dairying, and you have a very different animal from the one that used to be permitted to roam over perhaps a hundred acres in the field.

Take our dairy cows to-day, after they have been fed properly in the barn, and I let them out upon a rich pasture of growing grass, they would refuse to take a mouthful of food. You would say, it is unnatural. It is, in one sense, but what difference does it make if you provide the animal with superior food in your own dairy farm and in your system of handling that animal, have a profit, whether she eats grass or something else, and if you can bring that animal into such relations and conditions that you can afford to feed her a concentrated food from these by-products, why that is what you want and we have simply hinted at it. If you can balance up a ration in such a way that this cow will keep alive on this ration and the surplus she puts in the bucket, that is the verification of the method, and it is simply a business proposition, as much so as anything can be, and the whole thing is, to study the animal, to find out on what she thrives the best, and what is best for her.

Take those cattle at St. Louis. They tried different ways of feeding them, and you have heard me speak time and again insisting upon the right method of feeding the dairy cow. When they tried it at St. Louis and experimented upon different methods of feeding, what did they find? They found out that they had to come right back to cut hay instead of feeding long hay; found that they had to make up a regular mixture with hay and ensilage and grain to keep those cattle upon their feet. We know that is the only way, from experience. We are in the dairy day after day and have studied all these conditions; I call that common sense. To milk a cow seven months in the year and then let her lie simply fallow, to have a cow fresh in the Spring and let her go dry in the Fall, these are the methods that you are to consider.

We turn a cow out to grass in the springtime and let her go dry in the Fall, said some of the people when I was up there. They said the truth is that the milk gets so scarce up there in the winter time that we have to raise our babies on cider.

Situated as I am in the dairy business on a large farm and having no place for growing our own cattle for the first year or two, I was obliged to go into the market to buy a lot of cattle this Spring, although the Fall is the better time for buying cattle. In the Fall many persons have cattle running out and grazing, and then as winter approaches, and they realize that they will have to put them into the barn and feed them through the winter, they think that they had better sell and that is the reason why you can usually buy cattle at better advantage in the Fall of the year than you can in

the Spring. I was perfectly amazed when I went into some counties to buy cattle, and I could scarcely believe that modern farmers would be guilty of practicing such methods and still would go to church and claim to have common sense and self respect.

It is a strange thing that any one in charge of animal life will permit it to stand out in sheds or barns in the condition that I found these cattle. You might as well feed them on fence rails, and yet some of these people told me to my face that they fed these cattle grain. Why, it was difficult for them to stand up, much more difficult for them to produce milk, covered with all kinds of dirt and afflicted with disease; it is a wonder they were alive at all—yet these animals were called cows. There was no possibility that any man making a business of dairying could succeed under such conditions. It is a perfect outrage on society that such things should be. Talk about cruelty to animals; there is nothing more cruel. You can beat an animal and give it a tremendous beating and it is soon over, but to keep an animal standing in such condition for six months, practically in a state of famine and starvation, so that you can count every bone in its structure, why the very condition of the animal is changed, the very condition of its whole system is in such a state that you take that animal and put it into a good barn and attempt to feed it a balanced ration and you are defeated.

I thought I had studied the balanced ration pretty thoroughly and I thought that I knew pretty well how to handle an animal. I thought I could take these cows and put them into a barn and commence to feed them ensilage and cotton-seed meal, and that these cows would respond to such treatment. But no, they would stand and look at the ration as though they had never seen any thing like it before; they looked at it as if it was merely so much sand.

Now what shall we do with such animals? It was a problem and how did I solve it? I went to the corn crib, got nubbins and they ate them greedily. Imagine Detrich standing up before a lot of such cattle and going up to a corn crib for a bushel ration and getting out nubbins for a lot of scrub cows, cows so poor that you could count their ribs on each side, so thin that the wind could blow through them, in fact, in a perfectly horrible condition. And yet what did the people want for them? Why, they wanted the price of good cattle for them.

Look at the argument, and yet men say there is nothing in the dairy business; and I agree with them. I agree that no man will ever make a success out of such a dairy business! It is impossible for any man to do it. Then look at the cattle; talk about a scrub cow and a scrub sire; put them together and you get something still more scrubby, and then they feed them this miserable feed or no feed at all and call it the dairy business. No one can ever enter the dairy business and flourish under such treatment as that, and that is not an overdrawn statement either of what I found, and my own experience this winter in buying seventy-nine head of cattle, confirmed it, whether I went into one section of the country or into another, I found the cattle to be in this impoverished condition and the people that owned them were complaining that farming didn't pay; their grass fields showed it and their barns showed it, and they themselves showed it, as additional pictures of this famished condition of their dairy business. They never heard of a balanced ra-

tion; they wouldn't know it if they saw it, and they keep their cattle in sheds where there are just a few fence rails put up on each side with a lot of sticks on top. No doubt many of you have seen just such a cow shed as that. I said to one of them, "What do you want for your cow?" He said "Forty-five dollars." Why, I laughed at the man; the cow would have been dear at fifteen dollars. I saw a stable not very far from the center of this State in such a condition that I would not have given twenty-five dollars for the whole bunch of twenty-five cattle, in fact, I wouldn't have driven them home. The cattle were in a state of starvation; you couldn't have got them on their feet for three or four months. No cow is going to milk well when she can't shed her coat and she is liable to any and every disease. You are just as likely to run into target as not when you are going to feed them with their whole system impoverished and their circulation and skin gone wrong. You take a cow and her circulation is bad and she just stands in that shriveled condition with her back humped up, the worst possible condition for a dairy cow. The dairy business will never flourish and succeed anywhere under such conditions as those, and it is foolish to expect it. You cannot possibly bring it to pass. If you have scrubby animals, and then feed them scrubby feed, they are going to be the scrubbiest of things. On the other hand, you take a balanced ration, and have your cows balanced, and still more, the feeders balanced because an unbalanced man is the most fortunate of the two—I would rather have a balanced man than a balanced ration for a feeder, because he will know what the cow needs, and he will succeed, while if he does not know that, he never will succeed, whether he sends to the college and gets that ration marked out for him, just as nicely as it ought to be, whether it is a narrow or a wide ration, if he is not master of the situation and master of the individual animal, he will never feed that animal properly. He may feed her, but for the dairy business, he certainly will not succeed. He must know how to adapt his feed to the business and to the animal.

In looking then at the impoverished condition of some of the cattle which come into the eastern market at certain times of the year, if they were fed twice as much as they usually feed the whole bunch of them, they would be in better condition and in every way be better. You cannot get a cow into a real working condition in that impoverished state in less than three or four months, and what does that mean? That means four months of wasted time, or three months of wasted time because that means neglect and carelessness of the man who owns the animal. It is the man who is to blame in every respect. It is the man that makes the cow. It is not the cow's fault if she is bad; he has bred the cow; she has not. It is the man's business to use his intelligence to breed and feed the animal. The whole position puts the man in such a relation to the animal that he is not only the master of the cow, he is the keeper of the cow, the breeder of the cow, and the feeder of the cow.

Now what should we do with the dairy situation as it is in this country? We must provide the foods that to-day are in the market. You can have brewers' grain or malt stock if you want, or the refuse from the cotton mill or linseed mills, any one of them you can take them and balance them up to keep the animal alive and feed her enough besides to make you a profit, but if you are going to turn

your head, and say it doesn't pay, and turn your head away from the animals, and say, I don't care, I am not going to bother with cows; they are too much trouble. Don't attempt to keep a herd of cattle unless you make yourself master of the whole situation. Study the cow's whole constitution and understand your individual cows.

You can't take some old thing that has no nervous system and make a cow out of her; she must have a splendid nervous system in order to make a good dairy cow out of her. If you take a cow with a poor nervous system, you will never find one such cow to turn out to be a great dairy cow.

Take a horse that has the right shaped head, and well knit, well proportioned body. He has courage for any service that you want him for. Take a dairy cow again and look at her constitution. If she has a good nervous system, you may take that one friendless cow on the farm and take a shovel and go and dig it into her and never think of stroking her face and never think of stroking her hair the right way at all, but rather always the wrong way, when you do stroke it, and you will not have a good dairy cow, with such treatment as that. What is milking but simply taking so much vitality from the cow. When you begin to milk, you should commence to coax the cow, and learn to flirt with your cow a little; she will never fill the milk pail for you until you do. It is astonishing what a sympathy there must be between the dairyman and his cow. Just watch what she will eat and not what she leaves. Just feed her so that she will always eat it up nicely. She should not be confronted with feed that is not agreeable to her appetite. There is a foolishness in it you may say. Well, yes, I will admit there is, but there is also a profit in it, and the profit that you derive from the dairy animal under those circumstances will continue to enrich your farm, and the cow will continue to fill your bucket, and you will get the results that you are after. A man will say, "It costs too much to feed a cow in that way." Now what is your experience in the matter? Day before yesterday I had a spreader drive on the scales and the spreader contained a load taken from thirty-three cattle, and I had 2,650 pounds of manure on that spreader from the thirty-three cattle; it bore out my calculations splendidly. A good cow will make forty pounds of solid manure to add to the fertility of your fields, and thirty pounds of liquid manure to add to your fields when she is fed properly, and she will give you from twenty-five to thirty pounds of milk. Now look what you are wasting when you throw that into the barnyard. What is manure but plant growth? I would just as soon talk to a stone wall as to attempt to argue with a man who does not take as good care of his manure as he does of his milk; he is no farmer.

I regard a man as a merchant when he is like John Wanamaker; when he takes an old freight depot and starts a store in it, and fills it up with laces and silks, and studies his business until by and by he builds a proud marble structure eighteen or twenty stories high; I call that man a store-keeper; I call him a merchant. He knows his business. When a man takes care of his dairy as well, he will succeed. When a man takes off a crop of rye in May, I call that farming. When he puts in his grass seed in August, when the next season turns around, and he takes off two tons to the acre,

and in about five or six weeks takes off two tons more, I call that man a farmer that does it, and the man who simply cuts off and scrapes off white tops and mullen stalks, does not deserve the name of a farmer. You cannot possibly, under any circumstances under God's heaven, expect the dairy business to hold you up as a farmer or to furnish you as palatable food for infants or for society to-day, if you attempt to feed any such trash, and I don't see how you can attempt it and call yourself a good citizen of the United States.

The dairy business is a valuable one. There is no food on this earth so valuable and so nutritious for the infant, for the sick, for the hospital, as milk, and if a man is a true farmer or true dairyman, he would try to make better milk, and if he made better milk he would increase the consumption of milk just in proportion as it becomes improved and better, and a richer article. He would enlarge his business in that way, like John Wanamaker with his old Market street store starting as a freight depot and winding up with a marble structure; that is what the dairy business ought to be. There is nothing to-day that is taking its rise like agriculture in America; nothing stands higher than the business of the husbandman; nothing in the history of the world as we understand, stands higher than agriculture even if you go back to the days of Artaxerxes and Alexander the Great.

When Van Pelt commenced to experiment with the feeding of his Jerseys out there, he found there was nothing like making a proper combination of foods; for instance, if you have flour and water and fruit, and are going to take these ingredients to make a cake, you take your fruit and eat a little bit of this and a little of that, and you taste the sugar and it is just the same when you are going to make a pie as it is when you are going to prepare a ration for a dairy cow. Make your food rations so nice that you will tempt the appetite of the dairy cow to eat it. Take some hay; it is just as necessary for a cow that is a ruminant to have hay as to have anything like meal. Try to feed her nothing but bran or nothing but corn meal and see what will become of your cattle. Your cow must have cut hay, and have her cut ensilage and don't just throw it into her in any old way as if you were feeding her with white tops and mullen stalks. You want the very best clover that your farm can grow. You must have such elements down in your soil as phosphoric acid and potash, so that the plants can convey it to the animal. You start away down with a little plant, look at the difference between the various kinds of plants. Take an apple on the tree, a little knotty, stunted thing that grows in the shade and on a weak limb, and take one of Dr. Funk's splendid Winesaps and put it alongside such a miserable dot of a thing, with a worm in the end, and put it on your table, and compare it with the lucious Winesap. Now it is just the same with the cow. There is hay properly cured, and hay not half cured. You allow it to ripen properly and there is not a cow in the world but will eat it. No cow can digest a clover seed nor any grass seed, but you take it in the condition when it is just worked right and cured right and the food flows right into the plant. You get the potash of the soil. It goes up into the plant and you have a most succulent hay, with the succulence not burned out of it, and you prepare this with the best ensilage, that is, cut hay and use some bran, winter bran, some hay, and the linseed and the gluten

and you will make a complete ration for the dairy cow and make it really palatable for her. Don't say, "I salt my cows twice a week." How would your pie taste if your wife should say, after you had eaten it at dinner, "Go out and lick some salt in the kitchen." You are touching the animal on a very tender point. You let a little bit of grease get into that ration and see how quickly she turns her head away. You say the old cow won't eat that. No, and she ought not to eat it. You must adapt the ration to the cow. The ration may be splendidly digestible, but not palatable for the animal, and that is just what you have to test, and find, and choose, something palatable for the dairy cow.

You may take an animal in a certain condition, and you have a certain problem before you to learn the peculiarities of that animal. I know there are some people who think they are smart, and who shake their heads violently when this is suggested simply because they think that a cow is a cow, but you can't make a cow's milk rich on corn meal. The whole truth is this: You can do it in some instances. Some cows are in such a condition that you could not do very much with them until you get them in proper condition, and then when they are in proper condition, you talk about the lazy old cow, and you talk about the eight-hour man and the sixteen hour-woman. Why, they are not to be compared with the work of the cow, milking fifteen or twenty quarts of milk a day. She uses up more nervous energy than the horse on the street. She is using all her power. She gives us her power.

The trouble is the milch cow has usually had too much exercise for the profit of the dairy. When properly fed and watered, she won't go around exercising. Why? From nature and constitution and her four big stomachs, and she wants to chew her cud, and she rolls that over and over in her mouth. She wants quiet. A cow has that advantage that after she swallows, she commences to chew it over and over again. There is no more peaceful sight in the world than to see a cow that has been properly fed, with a real glossy coat and a splendid circulation of the blood, with a nice pliable skin, quietly chewing her cud, grinding it into the lacteal fluid that is afterwards to supply food for all human life. When you see these fine babies that have been nurished on her milk you begin to realize that there is nothing like the dairy cow. You may talk about the American hen, which is all right and proper, but there is no comparison to be made between the hen and the cow. You don't want a cow for beef, half steer and half cow; you don't want a cow either that is half cow and half goat. You want her to be a cow all over, the outside just as valuable as the inside and the inside just as valuable as the outside. Unless you know both sides of your question, you will never be a dairyman, and if you are a dairyman, you will find that there is a constant problem presented to you for solution. Every year that I have spent in the cattle industry has taught me that I have more and more to learn. I get letters time and again from people who want to take up dairying as a business. I got a letter only a few weeks ago from a gentleman who is Professor in a Virginia Seminary, saying that he would like to place a young man under my care and if I would receive him he would be very much obliged. I wrote a letter saying that I would, and the young man turned up shortly. When he came I asked him if he was fond of

cattle. Yes, very. Are you fond of chickens? Yes, very. Well, let us go to the dairy barn. We went out to the dairy barn, and I commenced to instruct him along that line, and he turned around and said, "I didn't know there was so much to learn about cattle." "Oh," I said, "You have not learned it all yet," and as I explained further, he said again, "I didn't know there was so much to learn about cattle. I thought you just fed a cow and got her milked, and that was all there is of it. He said, "It's a good deal of trouble, is it not?" "Yes," I said, "there is a good deal of trouble about it;" but I said, "This cow has to work here for 365 days in the year." A few days afterwards he wrote a letter home to his father that he wasn't feeling very well, and that he had a headache. His father came on and said his son was not very strong and that he would take him home. Now that boy will never make anything. You often cry that the boys leave the farm. Well, if they are like this boy, let them go; we don't want such stuff, and the quicker you get rid of that sort of material the better it is for the cow and the better it is for the farm, too.

Speaking of the dairy cow from these standpoints then, you can see very well what we think is necessary in their management, and as I have said, one of the chief things is, to provide this food in such a palatable way that it will tempt the appetite of the cow. The reason I insist upon this method of preparing the food is, that you will get the best results from it.

Now let us turn for a moment to the other side, and suppose that a man says, "I am going to feed the cow hay in the morning, and then I will give her some bran and gluten meal." The hay drags down under her feet, and he lets it remain there and then goes to feeding his other foods: Can you afford that? I can't. Wouldn't it pay you to put in a little bran when you feed her the dry feed? You will note that she dips into it greedily; perhaps she looks around this side and that side of the trough, and finds the bran is on either side. Suppose you have a hundred cows and are giving each one an ounce of bran. It is easy to figure out that if for each cow you feed an ounce, having a hundred cows, you cannot afford to have it wasted as I think is frequently the case. Now you want to prevent that. How shall you do it? You mix up the rations of the cow, hay, ensilage and bran, and put it before her in a proper way. She dips her head down and perhaps she will pitch the whole thing out. Now just put a stick across so that she can't pitch it out. We feed in a long trough. Ask Dr. Conard what he thinks about it. As the State Veterinary, Dr. Pearson, what he thinks about it. Ask any of the expert feeders of the country whether that is the way to feed a cow. In a lot of cows this cow is giving fifteen quarts of milk, and this one pretty near dry and that one past dry. Why, gentlemen, there is no more stupid feeding than that. You must have a system. I know it has been a main reason for failure in the business, such work as that, because of the carelessness connected with it. You can't afford to be careless. You can't afford to buy bran at a cent a pound, and cotton-seed at a cent and a quarter, and then allow it to go to waste, and let cows throw out 300 ounces of food a day. It goes right out into the manure pile and you can't afford to do it. You must so handle that food that you get returns in the way of milk or butter for every fraction of it. **In the handling**

of the food it is not simply enough to have a system of feeding, but there is a great deal in the way you handle the dairy cow and treat her as she stands in the stall. How often on the farms do you see some rough hired man go to milk a cow and he comes up to her and says, "Stand over here, you old thing," and he hits her alongside of the head to get her in shape to milk, instead of giving her a soft stroke down the back, or perhaps he goes at her with a real rough, new sharp curry-comb, and rubs it roughly up and down and along her sides and calls that currying. That is not currying, and no wonder with such treatment as that, that your cow does not produce the milk that she would if she was properly handled; or perhaps you neglect to brush her, or clean her off. You say she is not dirty. Now I want to say to you that a bath with a brush for a cow is just as important as a dust bath for a chicken, and just as important as a nice bath is for a good, hearty baby. Because a chicken is a chicken, does not amount to saying that it can be neglected, nor is it true of the cow. You are not satisfied when you simply sit down to a good table yourselves if you have no comfortable clothing and no comfortable heat in the room if you have the very best of food. You will say, "I am just dying for a drink, and you want the water," and so you see what it is to go through it. Your wants must be supplied; you must have comfort; you must have the water; you must have the food; you must have your bath, in order to be a real comfortable, healthy person, and it is the same with the dairy cow.

Can you make me believe that that cow is better because she roams the field, and she comes in in the evening with a little bag that is not thicker than my two hands, and you expect to get milk from her? You can't make me believe such stuff. I can take that cow and produce a very different condition, and yet you will say, keeping cows like Detrich does, it is all wrong. Every spot of land that he has ever touched and the little fifteen acre farm down at Flouertown was a hateful of money, and the man that ran it got a hateful of money for doing it. We are speaking about this from the standpoint of business.

That is not the half of it. We have only told you half, when we talked to you about the feeding of the cow. Here comes the great benefit for your farm, is getting the whole benefit of that undigested food which the cow could not turn into milk, and then isn't the dairy business paying when you can take all that you have bought in the market and after the digestible part has been turned into milk or into cream, then that which remains gives you the very thing that you want, and you know there is not a fertilizer that will compare with that manure that is made in a dairy barn.

If the cow is properly fed, you have the very same ingredients that your fertilizer bag claims to have. I would like to see the farm that can get better and better through commercial fertilizers. I can show you plenty of soil that has got better and better through the humus that comes from the dairy barn.

BREED.

Now to speak of the breeding of the dairy cow. Some man perhaps immediately thinks that we are about to advance some fantastic idea, and that these high-priced cattle are no good, because you

can't turn them out into the fields and the storm, and they are no good because they can't stand the climate and all such things as that.

If you have a real good watch, can you throw that watch around as carelessly as you would a two dollar or two dollar and a half watch that you buy? Can you take anything of value and throw it around in that way without care?

The very fact that the dairy cow is subject to all the changes of temperature, and changes of diet shows how valuable the cow is. It just shows what a treasure you have got, and that if you will just put her in a suitable place and keep her under circumstances suited to her health, that she will work for you; a thoroughbred can always do her work. It seems to me that she is very much like myself, it would take an immense amount of comfort to kill me; the more we realize these things, the better we shall succeed in the business. The truth is, a cow that is a cow is built for the purposes of making milk and butter and when she has fulfilled that purpose, I do not care whether she is in the Herd Book; I do not care whether she has come from the Island of Jersey or whether she came from the Netherlands, or where she came from.

Yesterday it was my pleasure—I got permission to be absent from this convention—to go to Cooper's sale to see a hundred head of thoroughbred Jerseys sold under the hammer at auction. It looked like a foolish thing, but I did it. Why, I couldn't afford to miss that sale. I have been going to Cooper's sales since 1882 and I have never missed one. There is no object lesson in this world better than that, and I have never read a book or come in contact with an animal that has taught me half as much about cattle or the dairy animals as I have learned at Cooper's sales, where I have seen the finest bred animals in the world for butter and milk, stand there under the auction hammer, and knocked down to the highest bidder all over these states. There was a sale yesterday and it is a pleasure for me to tell you about it. One of the finest animals that you ever saw was put up there; her body was just the ideal body that is described by every man who lectures on the dairy cow. She had all the points that a breeder would admire, and when she was knocked down under the hammer, \$2,500 was paid for that beautiful Jersey cow. No man would go and pay that for an animal if there was not quality there, if he did not know that he was buying an ideal animal. Another one was knocked off at \$1,700. Just to see what breeding has done, I have followed these sales for years and always with profit. Now what was the reason of this? Why it was the prepotency of these animals. No wonder they paid such prices. Somebody said they were fools and all such talk as that. You know talk is wonderfully cheap until you go and ask a lawyer something, and then you pay for it. Those are the cattle that win at the fairs every time. You go to St. Louis or any other fair and it is the thoroughbred animal that wins the prizes. If any of you are foolish enough to talk against thoroughbreds, you belong in the class with the old lady at the market who used the same tin cup to measure out apple butter that she did smear kase, and after a while you couldn't tell the other from which. You buy all sorts of stuff and in all sorts of ways.

But I want to go back a little to speak further of what was done at Cooper's sale yesterday. They had there some heifers sired by

a very celebrated bull. They led four of his heifers into the ring at one time and I would defy a man to say which one of his heifers was the best; they were marked almost exactly alike. They went up to \$900 and the auctioneer sold one at that figure and the man who bought it took the whole four. Nobody else had a chance at them.

Seven other fine animals were taken into the ring, and the bid on the first one was \$500 and the whole seven were taken by the same man. It shows what breeding is. You heard what Prof. Van Norman said on the subject last night. You don't want animals with as many colors as Joseph's coat, and you don't want all this confusion in business. What made that Flourtown farm, was the Jersey cattle on it.

They said, Detrich make a lot of butter, but he puts tallow in it and he hauls hay there at night. What foolish people! When I was a boy, five or six of us would start after a wagon and the fellows would try to catch on. Just as soon as one fellow would succeed in catching on to the wagon, we would holler "Cut behind." Isn't that the story of life? You holler "cut behind" as soon as one man succeeds. I just like to strike a man who is full of growl; I don't think there is anything that digests victuals better for me than to hear some fellow growl.

Perhaps you ask me, "What do you mean by a cow for a dairy?" I mean a cow that is on a dairy farm, a cow that is good inside and outside. There are certain external marks that help us very much in selecting and handling a dairy animal. Go to see the best samples of breeding. Why does Mr. Cooper go to the Island of Jersey and bring these cattle over here? Why, it is a little bit of an island? That thing was mentioned by Prof. Van Norman a little while ago. The little Island of Jersey have two or three fairs a year, and when a calf is born, a committee goes to look after the calf and to see whether it ought to go to the butcher or into the dairy. They go around and pass judgment; they examine that calf from the tip of his nose to the tip of his tail, turn him over, and that is the way I always do. I look at that calf; study the individual.

You know there is any amount of men who have sons that don't fill any niche or position in this world. They simply stand before the front door and pick their teeth. There is nothing so unfortunate as that; nothing so unfortunate for a young man as not to make himself the captain of his own manhood. Unless he is the captain of his own manhood, he is something like one of these scrubby cows, fit neither for the butcher nor for the dairy, and yet man is designed to be a master of nature. That is what his intelligence is for, and if he would fulfill his mission on earth and creditably act his part among his fellow-men, he must rise to the opportunities that lie before him, as the first and only being that has any promise of existence after death.

What dairyman can afford to put fat on an animal's back at two cents and a half or three cents a pound when she can put butter in the bucket at twenty cents a pound. There is the dairy question and yet farmers are always talking beef. They call for beef and for tallow.

What we want to do about the breed is to select the breed you

want. If you want the Holstein breed, you are perfectly welcome to it. On the other hand, I want the Jersey cow, that will give cream for your coffee and for your strawberries, and it is that cow I want when I want quality. You can't make as good butter out of Holstein milk as you can out of Jersey milk. Why? Because the Holstein is bred for a different purpose.

A Member: Mr. Chairman, I would like to ask the Doctor a little further as to the feeding of corn.

DR. DETRICH: I spoke of feeding bran, linseed and cotton seed meal. I never feed corn meal; I never feed a pound of corn meal. I fed corn nubbins on one occasion that I told you about because they wouldn't eat other feed. I have found out that you must feed for two things, and I feed for the farm as well as for the milk product.

A Member: What proportion of gluten do you feed?

DR. DETRICH: That depends just on the cow when it comes to feeding. We start a frame with this mixed ration in it with linseed, cotton-seed, cut hay and ensilage. We feed a cow according to her production as near as we possibly can. Now we start this—we start it on a large truck, and take it right around, feeding the cattle right and left. If there is a cow here, she gets her regular proportion of this, but if she will take more feed and turn it into a product, we will give that cow an extra amount of grain. We will not put any more bran in it. We try to put the bran in as a basis, and then we cut it up with linseed.

If the manure is too loose, we will take the linseed and gluten meal; if the manure is not right, we will leave out the cottonseed and gluten meal and put in more linseed. I know that oats is just as good, but oats is too dear.

I think I have stated to-day or some place that a cow's udder follows the manure. If the cow's droppings are right, I will guarantee that her udder is right; you must get that cow's system right. The fact that she does not shed her coat, some cows will not, that cow will not milk as she should until her coat is right. Her whole circulation must be complete, and she must be in splendid physical condition; if you find your cow is not in proper condition, you can judge what is best for her.

Whatever a cow can eat up, and put in the bucket, it pays you to give her.

MR. MARTIN: Mr. Chairman, it is the expressed desire of nearly all the delegates that we adjourn this meeting so that a great number of us may take the 3.30 train this afternoon, and if we do that, it will be necessary to omit some of these addresses.

There are several numbers yet on this program, that of Dr. Warren on "The Enforcement of the Dairy and Food Laws," and then Prof. R. L. Watts' address on "Soil Improvement Without Stable Manures" and "Economy in Beef Production, by Prof. T. I. Mairs, of State College.

Dr. Warren is not present, but is represented here by Mr. H. L. Banzhoff. I have talked with Mr. Banzhoff, and he comes here prepared to occupy a few minutes in explanation of the work along

the line of Pure Foods. We would be pleased to have him speak a few minutes and then we will listen to Prof. Watts, with the understanding that we are to have the manuscripts of Mr. Banzhoff and of Prof. Mairs for publication in our proceedings.

Mr. Banzhoff, representing Dr. Warren, addressed the Normal Institute as follows:

THE ENFORCEMENT OF THE DAIRY AND FOOD LAWS.

By MR. H. L. BANZHOFF, *Special Agent, Dairy and Food Division, Department of Agriculture.*

Mr. Chairman, Ladies and Gentlemen: Dr. B. H. Warren, Dairy and Food Commissioner, whom you have selected to speak to you on the subject—"The Enforcement of the Dairy and Food Laws" has been called to Washington, D. C., in consultation with President Roosevelt, in regard to the present meat investigation, and has requested me to speak to you on the above subject. Understand, however, not to take his place on the program, for this I am quite sure I would be unable to do, but I am glad, however, for this opportunity to meet with the representative farmers of the State of Pennsylvania, and, in greeting you, to give to you as briefly as possible on account of what is being done by the State in the direction of securing pure food.

The Pure Food Laws of the State of Pennsylvania, were enacted by the law-making body of our State, and signed by the Governor. These laws were not enacted to benefit a few, but for the protection of the masses. Yes, Mr. Chairman, I dare say to protect you and your family as well as every family that is represented here to-day from being forced to eat adulterated foods, or foods which contain preservatives, which are poisonous in nature and injurious to health. Did you ever think for a moment, when you sit down to partake of your meal, breakfast, dinner and supper, that you were unconsciously partaking of doses of chemicals, many of which are poisonous in their nature? I imagine I hear some one say, "Do you mean to tell me that there are manufacturers in the State of Pennsylvania as well as in all other states, that deliberately and knowingly use preservatives in the manufacture of foods which are absolutely poisonous in their nature and injurious to health?" To prove this fact, I call your attention to the first four thousand samples of various food products that were purchased under the direction of Dr. B. H. Warren, our Dairy and Food Commissioner, of which 82 per cent. of the same were sold in violation of the Pure Food Laws of the State, and proven by chemical analysis to be adulterated, while many were poisonous in character and injurious to health.

Let me call your attention to a few of these that your family and my family partake of daily: 1st. steak, or Hamburger steak, preserved with sulphites and colored with coal-tar dye. Fresh pork sausage, preserved with sulphites and colored with coal-tar dye. Bologna sausage, liver pudding, veal loaf, pressed ham, shredded cod fish, and many others that I might mention, preserved with boric acid and other ingredients injurious to health. Milk preserved with

formaldehyde, an important constituent of embalming fluid, which is used by the undertakers to prepare bodies after death, to preserve and keep them in a natural state for burial. In the city of Allegheny, in the year 1904, Special Agent Wilcox and myself purchased 49 samples of milk from the dealers, direct from their wagons as they were delivering to customers in the city. Out of these 49 samples, 28 were preserved with formaldehyde—this embalming fluid that I speak of, and three preserved with boric acid, and quite a number of the samples were skimmed and watered and low in fat. So you see that for the gain of the dollar, that the vendors in the city of Allegheny were not only willing to take chances in poisoning the innocent babies and invalids of that city who were forced to use milk as their only nourishment, but went a step further and robbed them by skimming and watering their milk.

Doubtless many of you have gone into a drug store on a hot summer day to get a refreshing drink. You step up to the soda fountain and ask for strawberry, raspberry or some other fruit flavor, thinking your drink was flavored with the natural fruit of the earth, when the facts were, that there was not a particle of the natural fruit in it, but simply a compound, with a coal-tar dye, preserved with salicylic acid and artificially flavored. One of the defendants in the courts of Allegheny county entered a plea of guilty, and said to his Honor, that he purchased the best syrups he could for the money. The Court in reply stated that if he could not purchase pure syrups to serve to his customers, he had better close down his fountain.

I also desire to speak to you in regard to some of the prepared fruits that are sold under the name of strawberry, raspberry, blackberry jam, etc., which contain but a very small percentage of the fruit; in fact, in a great many cases our chemists were unable to find even a trace of the natural fruit. These, too, were a compound of some inferior and cheaper substance than the natural fruit, colored with a coal-tar dye, artificially flavored and preserved with salicylic or benzoic acids.

I was informed by a traveling man, that he saw in one of our western cities, carloads of apple peelings and cores, and when he asked what they were going to do with this great amount of refuse, he was told that that was part of the strawberry, raspberry, blackberry and many other of the jams that he ate daily. So we might go on and speak to you of the many adulterations that we have found, tomato catsup, maple syrup, extracts of all flavors, shredded cocoanut, and vinegar. In this connection, I might say that I have purchased samples of vinegar for pure cider vinegar which did not have a trace of the apple juice in it; white wine vinegar that did not have a trace of the fruit in it. So I might go on and enumerate, but I think I have said enough to convince you that the makers of these food commodities are very little concerned about you or your health or the results from eating their bad food stuffs.

It seems to me all that concerns them is the dollar, or the profits they derive from their food stuffs, and they are willing to take all sorts of chances regardless of the Pure Food Laws of Pennsylvania. To prove that they are very little concerned about your health or my health in the sale of their production, very often it has been said when samples were taken and submitted to our Chemist for analysis

and found to be adulterated or preserved with a poisonous substance: "This has been a mistake of our shipper or our packer; these goods were not put up for the State of Pennsylvania but for some other state where the Pure Food Laws are not so vigorously enforced." So you can see, my friends, if it was not for the strict enforcement of the Pure Food Laws of our State, our markets would continue to be flooded with food products preserved with chemicals which would be poisonous in their nature and injurious to health; the facts are, we would be able to purchase but very little that would be true to name, pure, or as represented.

In regards to the enforcement of the Pure Food Laws of the State, let me quote to you the results of the work in Allegheny county from April 1, 1903, to May 7, 1906. Number of Pure Food cases prosecuted, 510; oleomargarine, 126; renovated butter, 44; a total of 680 cases prosecuted and finally adjusted. The amount of fines paid in Allegheny county during this period was \$46,074.50, oleomargarine and renovated butter license, \$77,439.16, making a grand total that has been remitted to the Department from Allegheny county alone of \$123,513.66.

The result of the entire work of the Department is as follows: In 1903 there were 1,800 cases, in 1904, 1,517 cases; 1905, 1,085 cases. The amount paid in the State Treasury in 1903 was \$93,458.71; 1904, \$96,183.23; 1905, \$82,467.60. Therefore, it is not necessary for me to consume any more of your time to try to convince you that the Pure Food Laws of the State of Pennsylvania are being vigorously enforced. I told you in the beginning, that of the first four thousand samples purchased under the present administration, which begun in the year 1903, that 82 per cent. of the samples were found to be adulterated, while to-day our chemists' reports show that the adulteration in the food stuffs is less than 10 per cent.

I want to speak to you briefly on the Oleomargarine Law and the enforcement thereof. Let me say to you in the first place, that there is not an oleo dealer in Allegheny county that does not understand the law. They not only make a close study of the law, but a very careful study of their local business, as well as every customer, and they are very suspicious of every new face. The facts are, the only encouragement they have to continue in the business is, that 75 per cent. of the people of Allegheny and surrounding counties are in favor of oleomargarine. One of the judges in that county in sentencing said, "He was only sorry that the minimum fine was not \$10 instead of \$100," but he was here to do his duty, and sentenced them to pay \$100 in each case.

It may seem to those having no experience in running down violators of this law, that it is a very easy task. But as one who has had the experience, let me speak of a few of the methods that were used in procuring samples of oleomargarine. As I have stated before, the oleo dealers make a very close study of their local trade, and are very suspicious of every new face, therefore, it is necessary for the agents to adopt such methods that will throw the oleo dealer off his guard.

Sometimes the agent will appear in the garb of a coal miner, railroader, iron worker or a farmer; and many times the agent will visit the store from time to time and make purchases of food stuffs, until such time that the merchant feels he is a regular customer,

and has satisfied himself that he is not an agent of the State, then he will sell the agent oleo for butter. In one instance, I went into a store and asked for some butter, some cheap butter. The dealer said, "I have not got any of that cheap butter." He said, "My neighbor has it for sale. I have no license to sell it." I said, "Do you mean to tell me that butter is licensed like liquor in this State?" "Oh!" said he, "I see you are all right; how much do you want?" I said, "I will take three pounds." He reached under the counter and pulled out a good sized basketful of the genuine oleomargarine. These are but several of the many experiences of special agents in the field.

I want to say to you that Commissioner Warren and his force are not leaving a stone unturned in their efforts to rigidly enforce the pure food laws of the State of Pennsylvania. Where persons are caught violating the law, prosecutions are inevitable. The work of the Dairy and Food officials is sometimes discouraging, but it is gratifying to report that the time and energy expended has been productive of definite and unquestionably beneficial results. For the continued friendly support and encouragement received in the past, grateful acknowledgments are due and hereby cheerfully tendered, and especially since the active work now in progress in this State originated under the care and auspices of the State Board of Agriculture, of which honored body many of you claim membership and maintained constant loyalty to all that which is good and for the best interests of the people of this Commonwealth.

I thank you most cordially for your patience and attention in listening to these somewhat rambling and disconnected, but earnest and heartfelt expressions in behalf of pure food, and consequent better health.

The CHAIR: We will now take up the first number on our program for this afternoon entitled "Soil Improvement Without Stable Manures," by Prof. R. L. Watts, of Scalp Level, Pa.

Prof. Watts gave an address on the above subject, which for lack of time to prepare a copy, the same is not inserted.

The CHAIR: We will now take up the next number on the program, "Economy in Beef Production," by Prof. T. I. Mairs, State College, Pa.

PROF. MAIRS: Mr. Chairman, I feel a little bit out of place here this afternoon after hearing so much talk about the dairy cow; but I want to assure you that had I given my talk as contemplated, I should not have antagonized the dairymen in the least. It is not the purpose of the beef advocate to say anything against the dairy industry, but so many of us eat meat as well as milk and butter, that it is necessary that some of us produce that meat. Most of our meat is beef. Of course there are a great many vegetarians in the United States but they do not seem to have any very great influence as against the rank and file of the country. The consumption of meat does not seem to have been especially affected by the comparatively small number of vegetarians, who say that the consumption of meat makes us beastly and gives us all the attributes of wild animals, which are carnivorous.

The questions which I was expecting to discuss here, are some of those which are connected with the production of beef, particu

larly in Pennsylvania. As you know, most of our beef is grown in the West, but some of it is grown in Pennsylvania, and it was my intention to try to show you how we can increase our beef production in Pennsylvania and to give you some idea of some of the work that has been done at the Pennsylvania Experiment Station along this line.

We have been investigating some of the questions there concerning beef productions, particularly some questions that are most important to us in Pennsylvania where land is more valuable than it is in the West and where feed is more expensive, and where a closer account and a stricter economy must be observed in the work.

Owing to lack of time Prof. Mairs was unable to read his paper, but the same is herewith presented and is as follows:

ECONOMY IN BEEF PRODUCTION.

By PROF. T. I. MAIRS, *State College, Pa.*

In spite of the fact that the last few years has seen considerable agitation in favor of vegetarianism in many quarters, the American people continue to eat meat. It is safe to say also that the people of Pennsylvania eat their share. No amount of fanaticism will induce the American people to renounce their so-called flesh pots. Science and history unite in the proof that the natural food of mankind is of both vegetable and animal origin. Vegetarian nations have contributed practically nothing to civilization. Since our people must have meat the question naturally arises, where are they to get it? By far the larger amount of the fresh meat eaten has been and must continue to be beef. Can we in this State produce a larger amount of beef to advantage or can we produce it at less cost than at present? Is it advisable to undertake to increase our meat production? Can we compete successfully with western growers and feeders of beef cattle? If so, then it is to our interests to study the various problems involved in order that we may carry the work on to the best advantage. Shall we feed western cattle or natives? Shall the feeder raise his steers or buy them? What type will prove most profitable? At what age should they be fattened? What feeds should be fed? How should they be handled during the fattening period? If we are to produce beef, we should try to know, why, when, and how the business may be made profitable.

The process of beef production naturally divides itself into three operations: First, growing the animals, second, fattening, and third, marketing. In order that beef production may be carried on with the greatest profit, it is necessary that care and judgment be exercised at each step. In speaking of beef production or cattle feeding, we ordinarily think merely of the growing and fattening processes. Although these are the operations that involve the expenditures they are by no means the whole thing. While it is necessary to get the best animals possible at the lowest cost, and to fatten them with the least expenditure of food and labor, intelligent marketing is also essential.

The first thing to consider in selecting animals for beef production is the type. This is of importance both to the feeder and to the

butcher. The best type for the feeder is that animal which will put on the largest amount of flesh in the shortest length of time and with the least expenditure of feed, at the same time having such form and quality as will enable him to be marketed to advantage. The best animal for the butcher is one which will produce the highest percentage of net carcass with the largest proportion of high priced cuts. It is not always the case that the best animal for the butcher is the best one for the feeder. For butchers who are willing to discriminate between good and poor animals because they are able to make considerable difference in the price of different parts of the carcass, it pays the feeder to select animals more largely from a butcher's standpoint. On the other hand, if the butcher does not discriminate between the good and poor animals because he must sell all his meat at practically the same price per pound, it is to the advantage of the farmer to select only those animals which will put on the largest amount of flesh and put it on most rapidly.

The type of animal best adapted for beef production is low, blocky, rectangular in shape with short neck, short legs, loose mellow skin, firm elastic flesh and quiet, gentle disposition. Such an animal will sell for the highest price in the market when properly fattened. Animals of the pony type are to be avoided; they are usually not profitable feeders because they do not gain well; although they may sell for a good price when marketed. The narrow backed, flat sided animal with long slender neck and thick hide will not take on flesh rapidly and even when fat, does not appear so.

A heavy, mossy coat of hair is an indication of good powers of assimilation. Short and even hair indicates a delicate constitution, rough and staring coat indicates poor digestion, while a coat of long dead hair would indicate a stunted period of some time in life.

The man who ships to a large center can afford to pay more attention to the type of animal selected and can pay a higher price in order to obtain the desired type than can one who feeds for the local butcher. The local butcher in general is not able to make much distinction in price between choice and ordinary animals.

Table I is intended to show why the local butcher can usually afford to pay more for a common animal than the city packer, but cannot pay relatively so much for the prime steers. The local butcher must obtain a higher price for his meat because he cannot sell the by-product to so good advantage. This table has been for the most part computed from figures furnished by Swift & Co.

Comparison of Retail Price of Beef in Chicago and in Country Town.

Cut.	1,200 Pound Steer.						1,000 Pound Cow.					
	Weight. Pounds.	Local.		Chicago.		Weight. Pounds.	Local.		Chicago.			
		Price. Cents.	Cost. Dollars.	Price. Cents.	Cost. Dollars.		Price. Cents.	Cost. Dollars.	Price. Cents.	Cost. Dollars.		
Prime of rib,	79.2	14	11.08	18	14.25	43.3	14	6.06	.....	.....
Porterhouse,	100.8	17	17.13	22	22.17	61.4	17	10.43	.....	.....
Sirloin,	37.3	17	6.34	18	6.71	22.7	17	3.85	.....	.....
Rump,	29.8	12	13.57	10	2.98	22.1	12	2.65	.....	.....
Round,	132.2	16	21.15	10	13.22	98.1	16	15.69	.....	.....
Sum,	379.3	.....	59.29	.....	59.34	247.6	.....	38.70	.....	.....
Neck,	9.0	8	.27	2.5	.18	14.4	8	1.15	.....	.....
Plate,	84.7	8	6.99	4	3.49	57.7	8	4.61	.....	.....
Plank,	24.6	8	1.96	4	.98	14.5	8	1.16	.....	.....
Chuck,	180.5	12	21.66	6	10.83	127.4	12	15.28	.....	.....
Skin,	19.8	10	1.98	3	.59	19.2	10	1.92	.....	.....
Shank,	22.1	10	2.21	3	.66	19.2	10	1.92	.....	.....
Sum,	340.7	.....	35.30	.....	16.75	252.4	.....	26.95	.....	.....
Total,	720.0	.....	95.82	.....	76.09	500	.....	65.76	.....	37.70

A good 1,200 pound steer will net 60 per cent. while a 1,000 pound common cow will net only 50 per cent. More than half the meat of the steer is in the high priced cuts, less than half of that of the cow. This table shows that whereas the Chicago retailer and the local butcher get practically the same for the high priced cuts of a good steer, the local dealer gets \$35.53 for the low priced ones which the Chicago dealer must sell for \$16.75, or less than half as much. Assuming that the steer cost five and a half cents per pound and the cow three cents the profit to the local butcher was \$35.82 or about 60 per cent. on the steer and \$35.76 or 119 per cent. on the cow. The profit to the Chicago butcher would be \$16.10 or about 27 per cent. on the steer and \$7.50 or 25 per cent. on the cow. The local butcher gets two-thirds as much for the low priced cuts as for the high priced ones. He can thus afford to pay more for the common stock than the city butcher can. The local butcher on the other hand cannot pay so much for the better animal because he can make more profit off the common ones and because he cannot realize so much on the by-products. Thus some animals can be sold to best advantage in a small town, others in large markets.

Whether the farmer should buy his animals or raise them is largely a question which each man must decide for himself. If pasture is plentiful and convenient it will usually pay to raise the animals. It frequently takes some months for the western animals to become acclimated and recover from the injurious effects of the long car ride. It may thus be found more profitable to raise the animals than to buy them from the West, even if western animals of the same size and quality can be had a few dollars cheaper than the natives. Another advantage in favor of the feeder raising his own calves is that he has complete control of them from the day

they are born, and the younger the animal the greater the gain for food consumed.

The age at which animals are fed has a great deal to do with their powers of assimilation. The younger the animal in general the less the cost of production. Professor H. R. Smith in his recent book on "Profitable Stock Feeding," gives the following figures: "Averaging six different trials when accurate records were kept of gains and cost of food it is found that during the first twelve months each 100 pounds of increase in live weight costs \$3.45; the second twelve months in the same animal \$7.42; and the third twelve months \$11.50."

At the Illinois Experiment Station a carload each of range bred calves, yearlings and two-year-olds were fed. At the beginning of the experiment the calves averaged 384 pounds, the yearlings 784 pounds, and the two-year-olds 1,032 pounds. The net cost of 100 pounds of gain was \$4.10 on the calves, \$5.60 on the yearlings and \$6.60 on the two-year-olds.

The profits in beef production, however, consist not alone in the increased weight of the animal but also in the enhanced value of the original carcass. Thus if an eight hundred pound animal costs four cents a pound and after being fattened sells for five cents a pound there is a profit of eight dollars on the original carcass. On the other hand, if the animal had originally weighed a thousand pounds, this profit would have been ten dollars so there is an advantage in favor of beginning with larger animals. This difference might easily be offset, however, by the greater age of the larger animal.

Where animals are grown for fattening the greatest profit will nearly always be found in fattening as young as possible. If western animals are to be fed it will usually be found more profitable to feed the larger ones, as long yearlings or two-year olds, on account of the greater margin afforded by the heavier original weight.

The young animals are producing muscles and other living tissues as well as fat. At the same time the carcass of the young animal contains a higher percentage of water so that less food is required for a pound of gain than after the animal becomes older. The muscles contain on the average about 66 per cent. water. Therefore only one-third of the gain in muscle must be made from the food eaten. On the other hand, the fatty tissue contains only about 10 per cent. water and must therefore be produced almost entirely from the food. As the animals grow older, cell activity decreases, growth is not so rapid and the water-content diminishes. Young animals, therefore, require a greater per cent. of protein and can use it to better advantage than older ones.

While muscle-producing foods may cost a little more per pound, they will often be cheaper than those capable of producing fat alone. Animals intended for beef production, should always be fattened while growth is still active. Growth continues up to four or five years although of course it is more rapid while younger, while in general it may be said, the younger the animal the more nitrogenous its ration; of course there is a possibility of making it too nitrogenous to be profitable. Protein for maintenance and for growth is all that is required. Any excess only goes to produce heat or fat and for that purpose it is too expensive. It seems to matter little

whether the protein is derived from the grain or the roughage. Corn fed with a leguminous hay seems to give fully as good results as corn and oil meal or cotton-seed meal fed with timothy hay or corn stover. The animal that has enough protein in its food and is young enough to make a good growth will not get patchy when fattened like the one that is older or is fed on a less nitrogenous ration.

In producing beef animals from common cows, the bull is considerably more than half the herd. The more the cows depart from the beef type the stronger the bull should incline toward it. This does not mean that a beef bull bred to high grade Jersey cows will produce profitable beef steers; he will not. Such breeding will always result in a loss. But the cow that is a heavy milker with a tendency to lay on flesh when dry, will produce a good steer when crossed with a beef sire. Whatever else is done the dual purpose sire should be avoided. The dual purpose cow may be all right, but the dual purpose steer has no place in the feed lot. When beef animals are wanted, a beef sire should be used; when dairy animals are wanted, a dairy sire should be used; if scrubs are wanted, a dual purpose sire will answer the purpose.

It is not safe to use any but a pure bred sire. He should be a good individual, well bred but not necessarily fashionably bred. It would not pay to put \$500 into a bull for a herd of twenty-five grade cows, but it probably would pay to put in \$100 rather than \$50. The calves would have to be worth only \$2.00 more per head to have the difference returned the first year. A high grade bull that is a good individual and whose breeding is known to be good may be better than a pure bred scrub, but such an animal is not often found; his breeding is usually unknown. Entirely too many of the bulls in this State are just bulls, without form and void. Like the proverbial mule, they are without pride of ancestry, but they certainly have hope of posterity so far as numbers are concerned. It is no wonder steers do not pay. There is too much competition at present to permit of spontaneous breeding being profitable. It takes no more feed to raise a good animal than a poor one; it may not take as much. It does take a little more intelligence.

According to the twelfth census, the farmers of Pennsylvania spend annually almost \$5,000,000 for commercial fertilizers. This is more than is spent in any other state except Georgia. A large amount of this could be saved by feeding the crops out on the farm and properly caring for the manure. Pennsylvanians are depending too much upon the West to supply their animals. They ship in their beef from Chicago, their pork from Buffalo, and their horses from St. Louis. It is a well known fact that fattening animals return a higher per cent. of the fertilizing constituents in their food than any other class. In an experiment at the Pennsylvania Experiment Station and published in Bulletin No. 63, 86.63 per cent. of the nitrogen, 82.98 per cent. of the phosphoric acid, and 93.95 per cent. of the potash in the food and litter of fattening steers was recovered in the manure. The actual amount recovered in any instance will depend upon the method of feeding and of handling the manure.

Tests made at the same station and published in the same bulletin, show that there is much less loss in manure with steers kept in pens or box stalls, where the manure is allowed to accumulate under them and is trampled into a compact layer, than with those kept

tied up in stanchions or stalls which must be cleaned out daily even when the manure removed is stored under shed. One of the conclusions of this test was that, "The money-value of the fertilizer constituents lost by the second as compared with the first method is equivalent to \$2.50 for each steer stabled for six months."

While this difference may seem small it is undoubtedly worth considering where fertilizers must be bought, especially since the trampled manure seems to be in better mechanical condition.

There is yet another advantage in the pen or box stall over the stanchion; that is in the saving of labor. The question of labor is always an important one. In no manner can the crops be fed with so little labor as to beef animals. One of the advantages which beef production has over milk production is in the less amount of labor required. A man can tend to fifty fattening steers as easily as to ten milk cows. The steers can be handled with much less labor if kept in pens or large stalls of from ten to twenty each than if kept tied up. They can be kept cleaner in the pens with less labor. They can be fed more quickly and much or little bedding may be used as desired.

Two tests were made at the Pennsylvania Experiment Station to compare the amount of time required to care for steers confined by these two methods. In the first test with five steers in each lot it appeared that it required about one-fifth more time to care for steers tied up than for those loose in pens. In the second test with ten steers in the pen and six tied up it appeared that 100 steers tied required as much labor as 180 loose in pens. The gains in live-weight and the consumption of food were practically the same for each lot. The results of these two experiments have been published in Bulletins Nos. 53 and 57.

It does not pay, therefore, to fasten the steers up with stanchions and chains. The greater expense for the equipment for the method is also against it. The practice of tying originated when steers wore horns and it was then necessary for the safety of both cattle and feeder, but now when everything is dehorned, the need no longer exists. A man buying cattle for feeders should refuse all that have their horns on. If he raises them of course he will dehorn them while they are young.

Warm quarters are not necessary for steers when being fattened. Experiments at Pennsylvania State College reported in Bulletins Nos. 64 and 74, have indicated that temperature of surroundings has very little to do with the economy of gains. In fact it has been proved that there is much more liability of basement stables being too warm than too cold for fattening steers. Open sheds well ventilated with a small dry yard attached are fully as satisfactory as barns. The cost of such sheds would of course be much less.

The preparation of the feed always requires some labor and expenditure. Even if the farmer raises his own corn it has usually been thought that it is not economy to feed it unground, but recent experiments at the Pennsylvania State College indicate that broken ear corn is about as valuable as corn and cob meal for fattening steers. Where the farmers lives some distance from the mill, the time lost hauling the corn to and from there is quite considerable. The miller will seldom grind for less than \$2 per ton. The ear corn may be broken as fed for a much less expenditure than that. A

man will easily break a ton of ears in less than three hours. It has been argued as an advantage in favor of grinding that cotton-seed meal or oil meal can be mixed readily with ear corn. While this is true it has been found just as satisfactory to put cotton-seed meal on top of the broken corn as to mix it with it. In this way the feed will be fairly well mixed by the cattle when eaten. Another advantage in favor of broken corn is that a greater amount of the undigested corn will be recovered by hogs if they have access to the steers. Where corn must be shipped in, it of course will be shelled on account of the freight. It might be better ground as the steers will not chew the shelled corn so well as the broken ears.

These are but a few of the questions connected with beef production, and they have been touched upon but briefly. It is not recommended that every one engage in the business or that it become as general as it is further west, but it is a profitable method of marketing corn, of utilizing pasture and of converting straw into fertilizer.

It is on the increase on some of the highest priced lands in the State, a fact which would indicate its profitableness. It is doubtful whether summer feeding is advisable, except for young animals, preferably natives. But that we can produce baby beef and fatten more steers to advantage is firmly believed.

On motion, the Normal Institute adjourned.

A. L. MARTIN,
Deputy Secretary of Agriculture and Director of Institutes.



PROCEEDINGS

OF THE

THIRTIETH ANNUAL MEETING

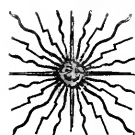
OF THE

Pennsylvania State Board of Agriculture,

HELD IN THE

OLD EXECUTIVE BUILDING, HARRISBURG, PA.,

JANUARY 22 AND 23, 1907.



MEMBERS

OF THE

PENNSYLVANIA STATE BOARD OF AGRICULTURE,

FOR THE YEAR 1907.

Members Ex-Officio.

HON. EDWIN S. STUART, Governor.

HON. HENRY HOUCK, Secretary of Internal Affairs.

DR. N. C. SCHAEFFER, Superintendent of Public Instruction.

..... President of the State College.

HON. ROBERT K. YOUNG, Auditor General.

HON. N. B. CRITCHFIELD, Secretary of Agriculture.

Appointed by the Governor.

Gen. James A. Beaver, Centre County,Term expires 1907

R. I. Young, Middletown, Dauphin County,Term expires 1908

Col. R. H. Thomas, Mechanicsburg, Cumberland County,Term expires 1909

Appointed by the State Poultry Association.

J. D. Nevius, Philadelphia,1910

Elected by County Agricultural Societies.

Term expires.

Adams,	A. I. Weidner,	Arendtsville,	1909
Allegheny,	J. S. Burns,	Imperial, R. F. D. No. 1,	1909
Armstrong,	S. S. Blyholder,	Neale,	1908
Beaver,	A. L. McKibben,	New Sheffield,	1908
Bedford,	W. C. Lutz,	Bedford,	1909
Berks,	H. G. McGowan,	Geiger's Mills,	1910
Blair,	F. Jaekel,	1013 10th St., Altoona,	1907
Bradford,	E. E. Chubbuck,	Rome, R. F. D. No. 16,	1910
Bucks, .....	.....	.....	.....
Butler, .....	.....	.....	.....
Cambridge,	H. M. Gooderham,	Patton, R. F. D.,	1910
Cameron, .....	.....	.....	.....
Carbon, .....	.....	.....	.....
Centre,	John A. Woodward, ..	Howard,	1909
Chester,	M. E. Conard,	Westgrove,	1909
Clarion,	S. X. McClellan,	Knox,	1910
Clearfield,	E. M. Davis,	Grampian,	1910
Clinton,	J. A. Herr,	Millhall, R. F. D.,	1908
Columbia,	A. P. Young,	Millville,	1909

Term expires.

Crawford,	J. F. Seavy,	Saegerstown,	1908
Cumberland,	Chas. H. Mullin,	Mt. Holly Springs,	1909
Dauphin, .....	.....	.....	.....
Delaware,	R. M. Heyburn,	Ward,	1908
Elk,	John M. Witman,	St. Mary's,	1908
Erie,	S. D. West,	Wattsburg,	1907
Fayette, .....	.....	.....	.....
Forest,	C. A. Randall,	Tionesta,	1907
Franklin,	C. B. Hege,	Marlon,	1908
Fulton,	J. L. Patterson,	McConnellsburg,	1910
Greene,	N. M. Biddle,	Carmichaels,	1910
Huntingdon,	Geo. G. Hutchison,	Warrior's Mark,	1909
Indiana,	S. M. McHenry,	Indiana,	1910
Jefferson,	Peter B. Cowan,	Brookville,	1910
Junata,	Matthew Rodgers,	Mexico,	1909
Lackawanna,	Horace Seamans,	Factoryville,	1910
Lancaster,	W. H. Brosius,	Fernglen,	1910
Lawrence,	Sam'l McCreary,	Volant,	1909
Lebanon,	H. C. Snively,	Cleona,	1910
Lehigh,	P. S. Fenstermaker, ..	Allentown,	1909
Luzerne,	J. H. Snyder,	Truckville,	1907
Lycoming,	A. J. Kahler,	Hughesville,	1909
McKean, .....	.....	.....	.....
Mercer,	W. C. Black,	Mercer,	1908
Mifflin,	M. M. Naginey,	Milroy,	1910
Monroe,	R. F. Schwarz,	Analomink,	1908
Montgomery,	J. Sexton,	North Wales,	1908
Montour, .....	.....	.....	.....
Northampton,	W. F. Beck,	Easton, R. F. D.,	1909
Northumberland,	I. A. Eschbach,	Milton, R. F. D.,	1908
Perry,	A. T. Holman,	Millerstown,	1910
Philadelphia,	Edwin Lonsdale,	Girard College, Phila.,	1910
Pike, .....	.....	.....	.....
Potter,	H. H. Hall,	Ellisburg,	1909
Schuylkill,	W. H. Stout,	Pinegrove,	1910
Snyder,	J. F. Boyer,	Freeburg,	1909
Somerset,	Jacob S. Miller,	Friedens,	1908
Sullivan,	E. R. Warburton,	Dushore, R. F. D. No. 3, ..	1908
Susquehanna,	Frank A. Davies,	Montrose,	1910
Tioga,	F. E. Field,	No. 209 Caldwell Ave., El- mira, N. Y.,	1908
Union,	J. Newton Glover,	Vicksburg,	1908
Venango, .....	.....	.....	.....
Warren,	R. J. Weld,	Sugargrove,	1908
Washington,	D. S. Taylor,	Raccoon,	1908
Wayne,	Warren E. Perham, ..	Niagara,	1910
Westmoreland,	M. N. Clark,	Claridge,	1910
Wyoming,	D. A. Knuppenburg, ..	Lake Carey,	1910
York,	G. F. Barnes,	Rossville,	1908

OFFICERS.

PRESIDENT.

Hon. Edwin S. Stuart, Governor, Harrisburg.

VICE PRESIDENTS.

J. A. Herr, Millhall.

E. E. Chubbuck, Rome.

S. X. McClellan, Knox.

EXECUTIVE COMMITTEE.

Hon. Edwin S. Stuart, Governor, Harrisburg.

I. A. Eschbach, Milton.

H. G. McGowan, Geiger's Mills.

H. C. Snively, Cleona.

W. H. Stout, Pinegrove.

M. N. Clark, Claridge.

M. M. Naginey, Milroy.

S. S. Blyholder, Neale.

Horace Seamans, Factoryville.

N. B. Critchfield, *Secretary*, Harrisburg.

ADVISORY COMMITTEE.

N. B. Critchfield, *Secretary*, Harrisburg.

M. N. Clark, Claridge.

H. C. Snively, Cleona.

I. A. Eschbach, Milton.

CONSULTING SPECIALISTS.

Botanist, Prof. W. A. Buckout, State College.

Pomologist, Dr. J. H. Funk, Boyertown.

Chemist, Dr. William Frear, State College.

Vet. Surgeon, Dr. Leonard Pearson, Philadelphia.

Sanitarian, Dr. Edward Patrick, West Chester.

Microscopists and Hygienists, Prof. C. B. Cochran, West Chester.

Dr. Geo. G. Groff, Lewisburg.

Entomologists, Prof. H. A. Surface, Harrisburg.

Prof. Franklin Menges, York.

Ornithologist, Prof. H. A. Surface, Harrisburg.

Meteorologists, E. R. Demain, Harrisburg.

J. L. Heacock, Quakertown.

Mineralogist,

Apiarist, Prof. Geo. C. Butz, State College.

Geologists, J. A. Harvey, Lock Haven.

W. H. Stout, Pinegrove.

STANDING COMMITTEES.

LEGISLATION.

Hon. A. J. Kahler, Chairman,Hughesville.
Hon. Jason Sexton,North Wales.
Hon. H. G. McGowan,Geiger's Mills.
Matthew Rodgers,Mexico.
S. S. Blyholder,Neale.

CEREALS AND CEREAL CROPS.

A. P. Young, Chairman,Millville.

ROADS AND ROAD LAWS.

D. A. Knuppenburg, Chairman,Lake Carey.

FRUIT AND FRUIT CULTURE.

John F. Boyer, Chairman,Freeburg.

DAIRY AND DAIRY PRODUCTS.

R. J. Weld, Chairman,Sugargrove.

FERTILIZERS.

R. F. Schwarz, Chairman,Analomink.

WOOL AND TEXTILE FIBRES.

D. S. Taylor, Chairman,Raccoon.

LIVE STOCK.

Dr. E. E. Tower, Chairman,Hop Bottom.

POULTRY.

Dr. M. E. Conard, Chairman,Westgrove.

FORESTS AND FORESTRY.

James M. Platt, Chairman,Tunkhannock.

APIARY.

J. W. Nelson, Chairman,Shawville.

FLORICULTURE.

Edwin Lonsdale, Chairman,Girard College, Phila.

FEEDING STUFFS.

G. G. Hutchison, Chairman,Warrior's Mark.

PROCEEDINGS OF THE THIRTIETH ANNUAL
MEETING OF THE STATE BOARD OF AGRICULTURE, HELD IN OLD EXECUTIVE BUILDING, HARRISBURG, PA., JANUARY 22 AND 23, 1907.

Harrisburg, Pa., Tuesday, January 22, 1907, 9 A. M.

Vice President A. J. Kahler in the Chair.

The CHAIRMAN: The hour has arrived for the opening of the Thirtieth Annual Convention of the State Board of Agriculture. The meeting will, therefore, please come to order, and we will proceed with the program. First in order, I believe, is roll-call. Will the Secretary please call the roll?

A Member: In calling the roll, I think it would be well to take note of the members whose terms expire this year.

The SECRETARY: The distinction will be made.

The roll of members was called by the Secretary, and at this first roll-call and a subsequent call, the following persons answered to their names, a quorum being present at first roll-call; the names of those present whose terms expire in 1907 being recorded in italics:

Gen. James A. Beaver, R. I. Young, J. S. Burns, S. S. Blyholder, W. K. Lutz (succeeding S. S. Diehl, whose term expired in 1906), *H. G. McGowan*, *E. E. Chubbuck*, John A. Woodward, M. E. Conard, *S. X. McClellan*, *J. W. Nelson*, J. A. Herr, A. P. Young, J. F. Seavy, John M. Witman, Geo. G. Hutchison, *S. M. McHenry*, Matthew Rodgers, *Horace Seamans*, Samuel McCreary, *H. C. Snavely*, P. S. Fenstermaker, *J. H. Snyder*, A. J. Kahler, *M. M. Naginév*, R. F. Schwarz, J. Sexton, W. F. Beck, I. A. Eschbach, *A. T. Holman*, H. Hall, W. H. Stout, J. F. Boyer, E. R. Warburton, *E. E. Tower*, J. Newton Glover, *August Morck*, R. J. Weld, D. S. Taylor, *Warren E. Perham*, *M. N. Clark*, *D. A. Knuppenburg*, G. F. Barnes.

Ex-officio members present were Hon. Edwin S. Stuart, Governor, and N. B. Critchfield, Secretary of Agriculture.

The following consulting specialists were present: Dr. J. H. Funk, Pomologist; Dr. William Frear, Chemist; Dr. Leonard Pearson, Veterinary Surgeon; Prof. H. A. Surface, Entomologist and Ornithologist; Col. Henry C. Demming, Mineralogist and Geologist, and W. H. Stout, Geologist.

The CHAIRMAN: The next thing on the program is the reading of the minutes of the last meeting; will the Secretary please read them?

Minutes of the last meeting were read by the Secretary, which, on motion, were approved.

The CHAIRMAN: Next in order is the appointment of the Committee on Credentials. I will name on that committee, Messrs. Herr, of Clinton; Blyholder, of Armstrong; Schwarz, of Monroe; Glover, of Union, and McCreary, of Lawrence. They will please examine the credentials of the members, and report to us later in the day.

The CHAIRMAN: We are now ready to receive the reports of Specialists and Standing Committees. The first in order, is the report of Prof. Buckhout, Botanist; is he in the room?

The SECRETARY: Prof. Buckhout is not present in person; but I wish to say that I have his report. It is for you to say what shall be done with it—whether it shall be received, and read, or placed on file to be published with the proceedings of this meeting.

A Member: I move that this report be received and placed on file.

The motion being seconded, it was agreed to.

The report is as follows:

REPORT OF THE BOTANIST.

BY PROF. W. A. BUCKHOUT, *State College, Pa.*

My intercourse with the farmers of the State and with the State Board of Agriculture has become scarcely more than that of a correspondent in answer to inquiries upon matters of practice more or less closely related to Botany. It is thus but little, if at all, separated from Horticulture. Moreover, the subjects of inquiry are for the most part simple and quite similar from year to year.

But, in accordance with custom, I may say that the chief inquiries have been plants sent in for identification. None of these have been out of the ordinary, and none presented any marked peculiarities. They were mostly weeds, and sent as such, with the request that some efficient method of eradication was desired.

It is unnecessary, and would be unprofitable, to take your time and mine in repeating the few simple points respecting weed destruction; the more so, since so many persons would still be unconvinced as to their practicability, and unsatisfied to find that there are no short and cheap methods which will help them out of a difficulty, generally of their own making, or their own sufferance.

Popular interest has been excited by accounts of the destruction of the minor water-growths by copper sulphate, with the consequent purification of the water; and some have raised the query whether the same treatment will not remove the more evident and bulky water weeds, such as eel-grass, water cress, etc. In reply it should be said that different kinds of plants are differently affected by copper sulphate treatment, and hence no general direction can be given which will fit every case. Rather must each case be specially

considered by itself. In many instances it may be noted that this method is quite out of the question on account of the expense or the danger involved.

There is still a good deal of popular interest in artificially growing medicinal plants; it is kept alive by the seductive advertising of interested parties who have roots and seeds to sell. The intending grower will avoid disappointment and loss if he will give careful attention to the conditions found necessary in the growth of such plants, and the essential differences between them and the ordinary plants of cultivation, which latter have become truly domesticated, and thus are essentially different from their wild prototypes. An acre of corn or potatoes is one thing, and an acre of ginseng or golden seal is a vastly different thing. There is no proper parallel between them beyond the fact that each occupies an acre of land. So carefully and impartially have these matters been considered by the United States Department of Agriculture that the best advice which can be given any inquirer is to write there for bulletins upon the subject. The series of Farmers' Bulletins which are sent gratuitously upon application, cover most of these subjects; and it is surprising how few farmers seem to know of them, or have the disposition to obtain and read them.

The transplanting of large trees is a matter of occasional interest and inquiry. It is no doubt sometimes entirely feasible and desirable to transplant large specimens of some particularly valuable kind, or, in order to produce some specific effect quickly. But, when one is confronted with this problem he will do well to make haste slowly and count the cost and try to forecast the results before he turns a shovelful of earth. There is no doubt but that it can be done and that the conditions which should control the process are quite well known, but the cost is often prohibitive and the results unsatisfactory. It is best to do it in the winter time, digging a wide trench around the base of the tree, as far away from it as the conditions will permit. Allow the large mass thus isolated to freeze, jack it up, and if the distance of removal is considerable, or there are obstacles in the way of carriage while upright, throw the tree prostrate in such a way as to bring the base squarely upon a sled or drag of some kind. The top should be liberally thinned out, in some cases the branches shortened in, and all parts to which chains or ropes are attached protected by flat slats and matting. When the ground is covered with snow or ice even a very large tree can be transplanted with great ease and placed in the desired position. The earth should be carefully packed in about the roots as soon as frost is out of the ground, and the trunk stayed with guy ropes or wires for a year or two unless it should appear to be more than ordinarily stable. A moment's thought will show the great advantage of winter removal and the greater success which it promises. It is no unusual thing, however, for the work to be done at other times of the year. But the expense is far beyond the means of most men. It requires special implements and devices to handle the great weight and awkward bulk, while the chances of satisfactory growth are not large in spite of the extravagant claims and exaggerated stories which interested parties may make.

Various cases of plant disease came to my notice, but few of which were of such a nature that material help could be given to the

case in hand. This is a common experience, since far more is to be expected from prevention than from attempts at cure. When blight, mildew, rust and the like have once gotten a foothold on plants, it is generally too late to save those particular plants, but the knowledge gained in the examination of the case should point out some way of preventing or avoiding future difficulty.

A case of ergotism, similar to that recorded in your Report of 1902, Part 1, Page 160, was specially noteworthy. In a stable having a number of horses, several of the animals became sick for no apparent reason. When a veterinarian was called in he pronounced the disease ergotism, and suspicion at once pointed to the hay as the cause. Samples of this hay sent to me were found to contain considerable ergotted grains in the red-top which made up the bulk of the mass. The grains were quite small and on that account could be easily overlooked. When rye, or any of the rye grasses are affected the grains are one-half to two-thirds of an inch long, thickened, also, and curved. These features, together with the black color, make them quite conspicuous. The relatively small size and perhaps small quantity of the ergot in this case led to but partial poisoning and made possible the prevention of fatal effects.

The work of the veterinarian and the work of the botanist may thus join hand in hand for the remedying of sickness and the prevention of injury to the life of our domestic animals. Such cases of poisoning, apparently not very common in Pennsylvania, are very frequent in some sections of the country, intensified, perhaps, by the crude methods of feeding and caring for stock. It would, however, not be surprising any day to meet with cases of poisoning of horses by feeding upon a poor quality of hay containing scouring rushes or horse-tails or upon the leaves or seeds of certain plants, when they are taken just at that degree of drying which has developed the poisonous hydrocyanic acid. Such cases have been known, but fortunately, are not very common.

In conclusion, I wish to repeat that the Botanical Department of the State College will be glad to continue to examine and make report upon the various matters concerning plants which our constituents may care to send us.

The CHAIRMAN: Dr. Funk is next on the program; is he in the room?

It appeared that Dr. Funk was not present at the time.

The CHAIRMAN: Since the Doctor is not present, we will take the next number, Report of the Committee on Fruit and Fruit Culture, by Mr. J. F. Boyer, Chairman; is he here?

Mr. Boyer was reported as not being present.

The CHAIRMAN: Is Dr. Tower, Chairman of the Committee on Livestock here? If he is, we will listen to his report, that being the next on the program.

Dr. Tower, being present, read his report, as follows:

REPORT OF THE COMMITTEE ON LIVESTOCK.

BY DR. E. E. TOWER, *Chairman.*

The number of domestic animals in the United States is estimated at 200,000,000, of which Pennsylvania has 3,335,319. Of this number there are 607,506 horses, 38,532 mules, 1,086,734 cows, 774,496 other cattle, 895,982 sheep and 98,008 hogs, the total valuation of which is estimated at \$116,464,168. It is estimated by good authority that these figures have been increased by about 10 per cent. during the last year.

Pennsylvania has 224,248 farms, which, according to the above figures, gives an average of about fifteen animals to each farm. While it is true that some of our farmers are striving to breed better stock, it is also true that a large per cent. of the stock thus bred are being sold to other states, and for which the farmer is getting good prices. Farmers are giving too much attention to the production of milk, and not enough to breeding, with the idea of improving their stock.

It is estimated that Pennsylvania imports about 15,000 dairy cows a year, mostly from New York and Ohio. This should not be; we can raise just as good dairy cows as either of these states; why not do it and save \$600,000?

The demand for good horses is continually increasing, and Pennsylvania should take some step toward breeding and raising more good horses. Nearly all of the larger type of draft horses are brought in from the West and sold at from \$200 to \$300, while the Pennsylvania breeder stands by and says—"I wish we could raise such horses here." Facts and figures go to prove that we can do anything that any one else can do.

The first thing to do in our State is to get the right kind of stock to breed from. One great setback to this business has come from the experience of several stock companies in different parts of the State, who united by neighborhoods and bought stallions at the enormous price of from three to four thousand dollars each, from some individual or firm who gave some influential man a two hundred dollar share for selling the balance of the stock. In every case of this kind, as far as I can learn, the stallions have been complete failures.

In one case which came under my own observation, a stallion, said to be an imported Clydesdale, weighing about 1,500 pounds, was bought by a stock company consisting of about fifteen men, for the sum of \$3,500. The leading man in the company received a \$500 share for selling the rest of the stock. This stallion was bred to fifty-four mares and got four colts, one of which was never able to stand alone. In the late fall, the stallion died a very mysterious death, and no investigation was made. This matter has been talked over in our meetings, and some good ideas advanced as to the matter

of obtaining some good, reliable stock to breed from, but the subject has been dropped, and we are at the same point we were five years ago. I hope this interest may be renewed, and a committee appointed to investigate and formulate a plan whereby we may be able to get some new blood of the right kind, and not depend on any other state for our good horses.

The breeding and raising of mules is another branch which could be taken up and a handsome profit derived from it. At the present time a good mule will bring from \$175 to \$200, and are very scarce at that price. A good Jack that will stand from 14 to 16 hands high, and weigh from eleven to twelve hundred pounds can be bought at from \$300 to \$500, and if bred to rangy mares the offspring will find a ready sale at from \$50 to \$100 each, at four months old. The expense of raising mules is small in comparison to that of horses, and the risk so far as blemishes and unsoundness is concerned, is less than one-half. The field is open to this line of breeding, and a fortune awaits the man who will take it up.

The sheep industry is not in a very prosperous condition, and will not be, as long as farmers and others continue to keep from two to four or five dogs that are allowed to go where they choose, at any time of day or night. More stringent laws should be placed on dogs, which would not only aid in restoring the sheep industry, but have a strong tendency to decrease the loss of live and prosperity of rabies.

For lack of statistics it is impossible to give an accurate estimate of the meat-producing animals of Pennsylvania, but from the report of Secretary Wilson, we glean the following, which covers the United States, and of which Pennsylvania is a part:

In the last census year, 1900, 93,502,000 animals were slaughtered and imported.

The national consumption was 16,753,295,000 pounds. This may be better understood if these figures are reduced to the average of the census family, which is 4.6 persons. To such a family, in 1900, the farmers supplied 49 pounds veal, 431 pounds beef, 30 pounds lamb, 39 pounds mutton and 465 pounds of pork, including lard, or in all, 1,014 pounds. Every time the clock ticks a second during ten hours of a work day, the farmer drives nine animals to the butcher.

Meat products are continually advancing. In 1900 the average price of meat per pound was 12½c., and has increased until now it will average 14c. per pound. An increase of one cent a pound costs this nation \$167,533,000.

The CHAIRMAN: Since Dr. Funk has come in now, we will listen to the report of the Pomologist.

Dr. Funk's report is as follows:

THE POMOLOGIST'S REPORT.

BY DR. J. H. FUNK, *Boyetown.*

It is with diffidence that I stand before this honorable body of God's Husbandry to-day as a representative of a suppressed, oppressed and bug-ridden sister industry, which was brought about by woman's indiscretion and man's weakness. Prior to the fall of the sovereignty of Adam, Horticulture occupied the position of honor as the highest and most honorable calling of man. But since that epoch, when beautiful Eve did, with her sweet smiles and seductive manners, beguile poor Adam, and he was driven from his primitive home to dig and grub for sordid wealth, and the necessities for his existence, it has become a nip-and-tuck existence. Agriculture requires so much grubbing, that horticultural products were classed among the luxuries; and even to the present time, some people look upon fruit as an article that can be dispensed with. But in most of the large cities and towns, as well as country districts, fruit has become as staple as wheat or any other products from the farm. And when choice fruit is placed upon the market, even in years of plenty, as has been the past one, the demand is good and remunerative and prices are well maintained. The crop of apples the past season was estimated at 36,120,000 barrels, or 12,625,000 barrels more than the crop of 1905. This means one-third more apples, or, in other words, just one bushel of apples for every man, woman and child in the United States—perhaps one-half the population are non-consumers. But that would again be off-set by the great waste throughout the producing districts, from neglect of gathering and handling at the proper time. From this source alone it is estimated there is one-fourth of the crop lost. Another source of great loss is poor car service and means of transportation, as well as scarcity and high price of barrels and other packages. The past season there were hundreds of carloads of apples shipped in bulk. These arriving at destination in poor condition, brought proportionately low prices, but choice fruit, put up in new, clean, packages, brought and are bringing prices but little lower than in other years when fruit was scarce.

There seems to be a certain equilibrium in nature—the more plentiful the fruit, the lower the price; the lower the price, the greater the consumption; the greater the consumption, the greater the demand; the greater the demand, the higher the price. When the maximum is reached, except in years of great scarcity, supply and demand bring about that happy medium that satisfies both producer and consumer.

A glut is brought about by large quantities of inferior goods being dumped upon the market. Choice or fancy goods always command the choice or fancy prices. Cream rises to the surface; skim-milk is sold as a cheap by-product. Therefore raise cream, and leave

the other fellow worry about the prices; be a producer of what the people want; produce something above the ordinary, either out of season or of superior quality.

Have you ever given a thought to the regularity with which things are governed? Year after year, age after age, how spring, summer, autumn and winter follow each other with slight variations; and how man's action and impulses are in the same order through all the seasons. Even the boys and girls follow the season, as though by printed program. At present they are engaged with their sleds and their skates, but soon, when the last snow disappears, before the ground is scarce dry, the girls will be merrily engaged with their hoops and ropes, and the boys with their marbles and tops. These pleasant occupations engage them for a short time, but at the approach of the March winds, they are laid aside until the following season, and in their place you will see in the school yards and farms and village streets, groups of boys with kites of every description, from two cross-sticks covered with newspaper and a few rags for a tail, to the fancy kites of varied hues, made in imitation of birds and butterflies, from the crude to the artistic, and, do you know, a wonderful lesson can be learned by watching this kite flying? It reminds us of human beings. How some scarce rise above the surface; others soar aloft, then lurch and pitch, and eventually fall, often bringing others with them in their down-fall; others, again, rise steadily to great altitude and maintain their exalted positions. The next in order will be swimming, and ball playing, etc. Thus it has been in the past, is at present, and will be to the end of time. We do not change much; Nature is a pretty steady old machine, and it is good for the majority it is so. We have become so familiar with Nature's program; it tells us when to plow, when to sow and harvest, when to plant the tree, when to prune. At the proper season, the sap begins to flow, the buds to swell, some to burst forth into luxuriant green foliage, others into beautiful bloom, with petals of varied hues, to be later developed into the ruddy-checked apples, blushing pears, the juicy peach or crimson berry. We often wonder at the regularity of her ripening seasons; the many transformations that are taking place around us.

Who orders these things? Not man; no; he cannot order or change the seasons; he cannot bring rain, or prevent frosts. Yet man is not helpless. He can so closely attach himself as to become a partner of Nature, working in harmony with her. He can by proper culture at the right time retain the surplus waters she has so lavishly spread over the earth by snows and rain during the season when vegetation was taking its long rest, and use it to his advantage, giving it to the growing plants during periods of drought. He can also, by proper culture at the right time, by proper fertilizers and pruning, grow and ripen the wood, and store up so much vitality in wood and buds, as to render them immune to ordinary freezes. He can by these means, and by properly thinning his fruit, produce annual crops of fruit, so who can say, that man, if he but observes Nature's laws, cannot, to a certain extent, control the growth of his crops?

The apple crop, the past season, was one rather above the average in quality, where sprayed; but where unsprayed, much of the fruit was badly infested with codling moth, fungus spots, and with San

José Scale. Many trees have borne their last crop, and thousands more are in their death agonies. In a very few years, unless the farmer awakens to his duties, the orchards that existed upon every farm and added so much to their attractiveness, as well as to the pleasures of farm life, will be a thing of the past, and the farmer will become a patron of the specialist who attends to the wants of his trees, and his condition will be more deplorable than that of the city man. After losing our possessions, we first realize their value. When the farmer's children beg for fruit, and he has none to give, then will he first see his folly and short-sightedness.

THE PEAR CROP

Was below the average, except the Kieffer's, which were very plentiful. There was so little demand for these inferior pears, that thousands of bushels were left to rot, and thousands more sold so low that they scarce paid for the handling. The only remedy lies in better culture, close thinning and pruning, and an abundance of the proper fertilizers. I think the Kieffer is planted rather more extensively than it should be, and the finer varieties, like the Bartlett, the Seckel, the Anjou, etc., are too much neglected. Prices for these finer varieties are steadily rising, owing to lack of supply.

PEACH.

The crop was far below the average in quality and quantity in most of the peach districts. Some orchards in the eastern and south eastern counties of the State had very heavy crops of extra quality, which brought very high prices, prices with me, the past season, running from one dollar to three dollars, per half-bushel basket. The manila or brown rot was very bad in some orchards, especially with early varieties. In some instances, fully half the crop was destroyed. With me the loss was very light, scarcely noticeable. I believe the spraying with the lime and sulphur is a great factor in preventing rot, by killing all spores while dormant, through winter and early spring. It is also a specific for the peach leaf curl and other fungus diseases. To be successful with peaches, none but hardy types must be planted, pruned to low-spreading, open-headed trees, that they get the full benefit of air and sunshine.

PLUMS.

Crop very light and poor in quality. The Japan varieties are proving very unsatisfactory, owing to some natural weakness of the tree, being very subject to the yellows, and other fungus diseases.

CHERRIES.

Crop was a full one of good quality, and prices were very good, considering the heavy crop. The sweet varieties should be more extensively planted, budded on Mazzard stock. The demand is rapidly increasing for choice sweet cherries.

All other fruit crops, including the berries, have been good and profitable this year. And the general fruit raiser has just cause to be very well satisfied with the financial results of his labor.

The average fruit raiser should endeavor to improve the quality of his fruit and put them in more attractive packages, when his reward will be greater.

SAN JOSE SCALE.

CONUNDRUMS FOR THE WISE.

Are we getting control of this pest?

Are the efforts of the Department doing as much good as could be expected?

Has their work been as successful as represented?

Is the present mode of instruction all that it should be, both scientifically and practically?

Are not too many important points in the manufacture of the Lime and Sulphur wash overlooked, misunderstood, or too lightly dwelt upon?

Is there not too much guess-work, and in instances of failure attributed to climatic conditions, when it should be attributed to the conditions of the man?

Is an unpractical man capable of teaching for best practical results?

Is not an unpractical demonstration more of injury than benefit?

Should there not be a Department of Horticulture established, and put into immediate force, whose entire purpose should be to build up and improve our fruit industries of Pennsylvania, which at present stands second in the production of the apple, that this high grade may not only be maintained, but that it may be advanced to the front—the position it can so easily attain and hold, if it receives the intellectual and financial help to carry forward the work?

The CHAIRMAN: What shall be done with this report?

On motion, properly seconded, it was agreed to receive it and file it with the other papers for publication.

The CHAIRMAN: Discussion on these reports will now be in order.

MR. McHENRY: I move you, before we do this, that there be a committee appointed to wait on the Governor, and inform him that the State Board of Agriculture is in session, and of the place of meeting.

The motion was seconded, and agreed to.

The CHAIRMAN: I will appoint as that committee, Messrs. McHenry, Blyholder and Naginey. They will please wait on the Governor, and report to us the result of their interview.

MR. HUTCHISON: This livestock question is a very important one, and represents a great industry in this State. We discussed it at our meeting two years ago, and had some very good points brought out by Governor Beaver, and a number of others. In the Doctor's report of to-day, he says we discussed it, but have done nothing. Is it not a good time to have a committee appointed, either by the State Board, or the Legislative Committee, and have them prepare or formulate a bill along the line of improving our live stock, and in the way of making preparations to establish an addi-

tional department to work along that line? We may resolve, and talk along certain lines, but if we don't take hold and do something, the talk is all for nothing, and don't accomplish anything. Now, I think that following the report, it would be a good time to go into the matter, and have our Legislative Committee sometime during this session formulate a bill.

Talking about raising mules, reminds me of a time, a few years ago, that a few gentlemen went to Kentucky, and bought several carloads of mule colts. They are now about two years and a half old, and they have no trouble in selling them at a large profit. That is one object lesson that has come to my notice. Now, there is no reason why this breeding could not be done at home, and the extra thousands of dollars that we are sending out of Pennsylvania each year should be stopped, and the money kept at home.

The agitation against the Beef Trust amounts to a great deal to the farmers of Pennsylvania, and has got these farmers to thinking, and to-day home-dressed beef is a great deal more in demand than it was a few years ago and the price of cattle has advanced in the State of Pennsylvania, and I think that the Livestock Breeders' Association should take hold of the live stock interest at once. I would move you now, that we appoint a committee to formulate a resolution to be presented to the Legislative Committee.

DR. TOWER: Mr. Chairman, that is exactly what I hoped, when I saw my old friend, Mr. Hutchison, come in. It would be impossible for me to have any other opinion. Ideas as to what the bill should contain should be given to this committee. Would it not be a good idea to point out to the committee what this bill should contain, before it goes to the Legislative Committee?

MR. HUTCHISON: I am interested in it, and am willing to work along the line in any way. Traveling all over the State, as I do, I see how much better the horse is, raised in Pennsylvania, than the one raised in Illinois, and I am willing to work along any line that may be suggested, to improve this industry.

The CHAIRMAN: It might be well to appoint a committee to formulate a resolution to present to the Legislative Committee. As Chairman of the Legislative Committee, it seems to me that it would be well to have the opinions of the members of the Board who are present. The Legislative Committee will be only too glad to receive any personal ideas, and now would be the time to do it.

A Member: I want to endorse what the Chairman of the Legislative Committee has just said; I don't think we can spend time on a subject of greater importance.

MR. McCLELLAN: I should like to say something regarding the horses that are brought in and sold at high prices throughout the country. People who buy from pedlers usually pay a very high price for a very poor article, but it is their own fault for buying this way. If they went direct to the breeder, they would get a better horse at forty per cent. less money. The horses that are pedled throughout the State, are those that no good horseman would buy. I have been told by two or three breeders in Indiana

and Ohio, that they must have from thirty to forty per cent. more for horses if they peddle them out. They must pay for the horses' keep for three or four months, and also the expenses of the man, and they must have a higher price.

THE SECRETARY: I would like to say right here that we would like to get the name of every one that participates in these proceedings, so that when you come to read the report, you may know just what was said, and who said it. If the Chairman is unable to give the name, we would be very glad if you would mention your name, so that we may have the record.

EX-SECRETARY EDGE: The main part of the question seems to be the appropriation. Now, we can hardly hope to secure this this year, but if we present the bill properly, and arouse the interest of our people, we will probably have no trouble to get it by another year.

MR. HALL: It seems to me that we are a little tender of the prerogatives of the Legislative Committee. Would it not be well for the Chairman to appoint a time to hear those who have anything to be brought before this committee? If we don't want to appoint a committee, we could go along this line.

MR. HUTCHISON: I have great respect for Ex-Secretary Edge's opinion along this line. He has done a great deal for this State. And as he says, the great thing is the appropriation. We want in this State an appropriation of four or five thousand dollars for the improvement of live stock, the same as they have in Belgium. One way of getting the people interested is the money. That will bring about results. The suggestion of Mr. Hall is a good one, that the Legislative Committee sit while we are here, to get the opinions of those interested in the matter. We may be able to thrash something out of this, and get something for good. These are times when people are coming here, and asking for large appropriations for every good cause, and why should not the agriculturists have their share? So why not see the Governor, and tell him what we want?

MR. NELSON: I would like to ask for information, whether Brother Hutchison intends to include that small, but industrious insect, the bee, in the live stock interests of Pennsylvania? If he does, it will be a very good thing.

I think that those opposed to the creation of an additional department, may come in with us if the work is done, and the appropriation asked for, by the State Board of Agriculture. And if the Stock Breeders' Association, and the Dairy Union, and similar organizations, would join with us, it would enable us to get a larger appropriation.

THE CHAIR: I believe the proper thing to do is for us to reduce the matter to a resolution, and let this resolution be handed in to the Legislative Committee. And I would say in regard to the other organizations coming in with us, that I understand this will be the case. We will have resolutions from our other organizations, and can embody them in the bill. Now, the way to do things is to do

them, and unless we do them our talk will not amount to anything. Put it in the form of a resolution, and then this can be brought before the Legislative Committee.

A Member: There is a motion before the house, which should be disposed of before we go any further.

The CHAIR: The Chair's impression of the motion was something like this: That the Chair appoint a committee to formulate a resolution to be presented to the Legislative Committee. That is my impression of the motion. If I am mistaken, will you please make the necessary correction?

MR. HUTCHISON: I beg your pardon for speaking so often. The one thing to do is to get this thing under way. I have great respect for the bee; there seems to be a future for it; and if it will help us to get the appropriation, I am willing to include it. But the thing is to return to our subject, and get it under way.

DR. FUNK: Mr. Chairman, if they include the bee, they will have to include horticulture to support the bee.

The CHAIR: Are there any further remarks, or are you ready for the question? Has that motion been seconded?

The motion having been regularly seconded, and the question put, it was agreed that the Chair should appoint a Committee to formulate a resolution to be presented to the Legislative Committee.

The CHAIRMAN: I will appoint the following gentleman to serve on this committee: Mr. Hutchison, Mr. Tower, Mr. Nelson, Dr. Funk, and Mr. Chubbuck. They will please formulate such a resolution, and present it to the Legislative Committee for action.

The CHAIRMAN: Next in order is on the report of Dr. Funk, the Pomologist; we will willingly hear any remarks on his admirable paper.

MR. SEXTON: I would like to ask the Doctor what he considers the best thing that has yet been found for the San José Scale, and further, whether some of the Scalecides that are now on the market, and are so much easier to prepare than the lime, sulphur and salt, would not answer the purpose just as well? The lime, sulphur and salt, is troublesome to prepare, and I would like to know whether there is not something that can be bought, and mixed with water, that will answer the same purpose?

DR. FUNK: In answer to the question regarding lime, sulphur and salt, I would say that so far as known at the present time, there is nothing that equals it. And for this reason its purposes are dual. It is both a positive remedy for the San José Scale, and one of the best fungicides that we have at the present time. I believe it is a specific for the Peach Leaf Curl, and for the Manila or Brown Rot. Since I sprayed this winter I find that the Brown Rot has practically disappeared from my orchard. It also destroys the spores, but I have come to leave out the salt, and use only the lime and sulphur.

Now, as to other preparations, I would say that the crude oils are dangerous in the hands of most people, even in the form of kerosene,

etc., but there are several of the "cides," like scalecide, killicide, etc., that do admirable work to a certain extent; but they are not good for anything but the scale; they will not destroy the fungus. And another thing against them is their price. They sell from fifty cents a barrel to a dollar a gallon, and do not do the work that the lime and sulphur does. But there are preparations of soluble oils, for which the formula is now being prepared by the Department, for public use, which the farmer can prepare more easily than the lime and sulphur; they can be had at a very low price, and in such form that all the farmer need do is to get a gallon of them, and put it in twenty gallons of water. But it must be understood that this will destroy only the scale, and not the fungus.

The SECRETARY: Dr. Funk speaks of a bulletin that is now in the course of preparation in the hands of the printer, which will give all the information that the State of Pennsylvania has on the subject. I don't know how soon it will be out, as the printer is somewhat behind in his work, but I should say in the course of the next month or six weeks.

REPORT OF COMMITTEE ON CREDENTIALS.

MR. HERR: The Committee on Credentials would respectfully report that credentials have been received from the following persons; that all credentials have been examined and found correct, except the credentials from Clarion County are not on the form prepared for that purpose, and do not give the certificate that the Society is entitled to representation in the State Board:

Name.	Address.	Term Expires.
D. A. Knuppenburg,	Lake Carey, Wyoming Co.,	1910
J. D. Nevius,	Philadelphia,	1910
(Appointed by the State Poultry Association.)		
Horace Seamans,	Factoryville, Lackawanna Co.,	1910
Henry C. Snively,	Cleona, Lebanon Co.,	1910
Frank A. Davies,	Montrose, Susquehanna Co.,	1910
M. M. Naginey,	Milroy, Mifflin Co.,	1910
E. M. Davis,	Grampian, Clearfield Co.,	1910
W. E. Perham,	Niagara, Wayne Co.,	1910
Howard G. McGowan,	Geiger's Mills, Berks Co.,	1910
W. C. Lutz,	Bedford, Bedford Co.,	1909
A. T. Holman,	Millerstown, R. F. D., Perry Co.,	1910
S. M. McHenry,	Indiana, Indiana Co.,	1910
E. E. Chubbuck,	Rome, R. F. D. 6, Bradford Co.,	1910
N. M. Biddle,	Carmichael, Greene Co.,	1910
Peter B. Cowan,	Brookville, Jefferson Co.,	1910
M. N. Clark,	Claridge, Westmoreland Co.,	1910
S. X. McClellan,	Knox, Clarion Co.,	1910

The committee still further report that they have examined the credentials of the following persons, representing Agricultural Organizations, and recommend that they be admitted to sit as **Advisory Members**:

S. P. Heilman, Heilmandale, Lebanon county.
M. D. Heilman, Heilmandale, Lebanon county.
Ira J. Light, Lebanon, R. F. D. 5, Lebanon county.
J. F. Brubaker, Lebanon, R. F. D. 7, Lebanon county.
J. P. Brendle, Shaefferstown, Lebanon county.
Moses Yingst, Prescott, Lebanon county.
John H. Bennitch, Richland, Lebanon county.
H. M. Keller, Biglerville, Adams county.

J. A. HERR,
S. S. BLYHOLDER,
SAMUEL McCREARY,
R. F. SCHWARZ,
J. N. GLOVER,
Committee on Credentials.

It was moved and seconded that the report be received and adopted as read, and that the members named in the report should be seated as recommended. Agreed to.

On motion, duly seconded and agreed to, the following gentlemen were elected as Advisory Members: James E. Stephens, J. E. Fleisher and William Wertz, representing The Perry County Agricultural Society, and Hon. W. C. Pomeroy and Scott McLaughlin, representing Juniata County Agricultural Society.

MR. SCHWARZ: I agree most heartily with Dr. Funk that there is nothing like the lime, sulphur and salt for the San José Scale; but if the statement is true that was made at an institute in Northampton county, that Dr. Miller had started to spray with scalecide and found, after the season was over, that it had destroyed all indications of fungus, it should be looked into. It is much easier to prepare than the lime, sulphur and salt, and if it is any good, I think the Department should authorize it, and tell the farmers to use it, if they can't do any better.

The CHAIRMAN: In connection with what has been said, the Chair has had some experience with scalecide, and that is just this: In the first instance, it does not go near as far as they say it would.

MR. HALL: I just wish to suggest to Dr. Funk where he said it costs from a dollar a gallon to fifty cents a barrel, that he probably meant to reverse these figures.

MR. HERR: I don't think it is the policy for the Board to recommend any patent preparation on any subject to any member of the Board. It is true these things are on the market, and we have no objection to the individual using them giving the party a testimonial, if he wishes, but I don't believe the Board should commit themselves.

DR. FUNK: From the soluble oils, for which the formula will soon be published, the user will get better results than from the preparations that are now on the market. Those on the market are all manufactured according to one formula, but if you make the soluble oil preparations yourself, you can make them mild or drastic, just as you want them. Now, if you have an apple tree that is in an

advanced stage, you will want it much more drastic than you will for a peach tree that is just starting. If you make it yourself, you can make the ratio high or light, just as you wish. You can make it 14 to 1, or 20 to 1, just as you like. So I think they will be better than the preparations on the market.

MR. HUTCHISON: There was a suggestion made that we create a Department of Horticulture. I presume this will be a part of the Board of Agriculture, and I think this should be done because the Department of Horticulture is an important one, and I think the Board should take some action toward creating this Department.

MR. CLARK: I don't want to offer any results, but I want to tell you what we did on our farm in Southern Indiana the past few years. We tried to see first what we could do with lime, sulphur and salt, but it is so troublesome to prepare that we finally decided to see what could be done with kerosene. We did so, and I want to tell you the result. The Scale, I suppose, is as nearly destroyed in our orchards there, as in any other orchards, where they have used other preparations. We lost a few trees by too much oil, but very few in comparison to the whole number. But I noticed this: the loose bark on the trees nearly all fell off, and the trees are quite smooth. There is no place for the little insects to harbor. We are so well satisfied that we shall continue to use it.

MR. HUTCHISON: Did you dilute it?

MR. CLARK: No, not on the larger trees, but on the smaller trees we used about 1 to 20, and the smaller trees were the ones we lost.

The CHAIRMAN: Will the gentleman please tell us on what kind of trees he used it?

MR. CLARK: Peach, apple and pear. We are too far south to raise a good apple, but our apples were as fair as any on the market; the peach crop was a failure this year in our neighborhood. But this is the home of the Kieffer pear, and we shipped the largest Kieffer pears on the Louisville market. Two other parties shipped probably as good; none better. Now, I tell you this just to show you what can be done. The good pears that were taken to the market commanded a good price. I tell you that we shall continue its use. Unless farmers do something, they will have to go out of the business, and it is the hardest thing in the world to get a farmer to use lime, sulphur and salt. There are only two things to keep in mind in the use of kerosene: to be careful and to use a small quantity. We can easily use it.

MR. SNAVELY: I want to put this question to Dr. Funk: whether the use of these crude oils is not going to prove eventually destructive to the tree?

DR. FUNK: It certainly will; we know that all oils will injure the tissue of all vegetable matter. We know that pure kerosene will destroy the scale, and if a man will select for his work an ideal day, and force the pressure through an exceedingly fine orifice, making an exceedingly fine mist, it may be all right, but the danger is that he

may destroy all his fruit. There is where I consider the soluble oils will come in. We will then know exactly what we are doing. When mixed with fourteen or twenty gallons of water, you have a preparation that will not injure the tree as much as a pure oil will. If I were going to use a pure oil, I would use kerosene, instead of crude oil, because it will not leave a varnish.

MR. WELD: I want to ask Dr. Funk whether this year has been peculiar in the development of the Oyster Shell Scale? It has been present in my orchard, and some of my friends', and I think it is thicker than I have ever seen it before, and we must, in our county, report the death of some trees from it. I don't think we are infected, because we were examined early in June, and no scale reported. Now, is it peculiar to this winter, and what had we better do with it? Is there any danger of it increasing, and destroying the orchards further?

DR. FUNK: The Oyster Shell Scale is one of the three scales that infest our orchards here—the San José Scale, the Oyster Shell Scale, and the Scurfy Scale. But where the trees are thoroughly and completely sprayed with lime, sulphur and salt, it will destroy the San José Scale, the Oyster Shell Scale, and the Scurfy Scale, and we have also found that it will destroy the Tent Caterpillar. It used to be considered impossible to destroy the nest of the Green Aphis, but we find that if we use the lime, sulphur and salt, we will destroy all of them.

MR. WELD: There is danger, then, of that Scale increasing, and giving us very serious trouble?

DR. FUNK: It certainly will destroy the trees.

MR. SNAVELY: Which increases the quicker, the San José Scale or the Scurfy Scale?

DR. FUNK: Where we have four or five progenies of the San José Scale, we have here but one; when we come down to latitude 38 degrees, we have two, but here we have only one.

MR. WELD: How many broods has the Oyster Shell?

DR. FUNK: Only one on an average, but in long seasons, you may have two.

MR. RODGERS: What time of the year do you put on the lime, sulphur and salt, and what time the oils?

DR. FUNK: I would prefer using the oils just as late as I could; just before the blossoms swell; there is more resistant power at that time. As I say, I am a little scary on the oil question, but some trees are more resistant than others. Take the Ben Davis, and the York Imperial; they are both infected. You examine the Ben Davis, and you will find it infected down to the red, while the other will hardly be touched. Why the San José Scale discriminates thus, I leave to you.

MR. RODGERS: What kind of a day would you use—a clear, sunshiny day?

DR. FUNK: Most certainly; I want a quiet, sunshiny day, or it will not dissolve the oils as quickly as necessary.

MR. SNAVELY: A few other matters I want to ask the Doctor: Whether it is safe to spray any time after the foliage is off the trees? Now, my experience is that it is not safe to spray peach trees with salt. We cut it out altogether, and use only the lime and sulphur. In my experience, it is not safe to use salt; it has killed a large number of buds.

DR. FUNK: Can't you go further, and say terminals?

MR. SNAVELY: No; but I can say that it is not safe to use salt on peach, or Japan plum trees in the fall.

DR. FUNK: I think if you will go back to my last year's report, you will find that I say the terminals on peach trees were killed by the use of salt in the fall, and I would not think it safe to spray a tree in the fall, but in the spring, when they have the most resistant power.

MR. RODGERS: Heretofore, at our meetings, you have recommended lime, sulphur, and salt, and now you do away with the salt; for what reason do you do away with the salt?

DR. FUNK: Because it is useless; I find it is even injurious on tender leaves, owing to the chlorine in salt, and it is a large expense, and I find that the lime and sulphur adheres equally long without it. I can show you trees in my orchard that we sprayed last spring, where it is still on. Experience, you know, improves us, all along the line.

MR. GLOVER: I would like to know whether you know of any one who is fixed up to go around and spray for farmers?

DR. FUNK: There is a party near Germantown who is doing that kind of work, but I don't believe it will ever be a success. Anybody may fix up a machine to do this, but I don't believe it will ever be a success, because weather conditions will not warrant it. You can spray with an October wind, but you can't spray against it; now, when we were spraying our orchard last winter, the wind blew in one direction for all the time except three days. We had all our orchard covered on one side, and only three days to spray the other in. Now take a case like this; he may go and spray for John Jones or Peter Smith, and may spray on one side for fifteen days, and then have only three days to spray the other in, and his engagements would make it necessary for him to go to some other orchard; what would be the result? Why, the orchard being only sprayed on one side, and the work incomplete, the man would refuse to pay for it, because the work was not done according to contract.

Any man can get a hand pan of eighty to one hundred pounds pressure, and then he can go around and spray his trees. Then he

will be successful. So long as you have some one to work for you by contract, you will never be successful. He will want to go from one job to the other, and this will leave just so many trees more for the following summer.

The CHAIRMAN: If there is no further discussion, we will go on with the next number on the program, which is Unfinished Business.

It appeared that there was no Unfinished Business to be brought before the house.

MR. HUTCHISON: We have with us Professor Hunt of the Experiment Station, who was also with us last year, and we shall be pleased to have him say a word.

PROF. HUNT: I think, with your permission, I will not take up any of your time this morning. It is very kind of you to give me the opportunity to address you, but as I am to speak to-morrow morning, I will not take up your time now. I thank you for the kindness, and trust I shall become better acquainted with you before the end of the Convention.

MR. SNAVELY: If there is no other business before the Board, we might as well proceed with the election of officers.

The CHAIRMAN: That does not take place until Wednesday morning, according to the By-laws; but since there is no Unfinished Business, we shall be glad to hear from any one before we take a recess.

DR. FUNK: I would like to hear from some of these people who have sprayed with lime, sulphur and salt, or who have had demonstrations on their places.

MR. SEXTON: I would like to inform the Doctor of my experience with lime, sulphur and salt. The subject is an important one, and one well worth talking about, and while we are on it, we may be able to learn a great deal if we continue the discussion. About two years ago, when our trees should have been sprayed, I was too busy to attend to it myself. There is a nurseryman not far away, who has the paraphernalia and goes around the township spraying trees, so I had him come and spray mine; my trees were badly infected, and are still, although they have been twice sprayed with lime, sulphur and salt. How do you account for that?

DR. FUNK: I hope this will bring up one of the Conundrums.

MR. SEAVY: Some of my neighbors and I found that we had the San José Scale, and we had a man down from Erie County to look at our trees; he said, "You have the San José Scale, and your trees will die." But he set at it, and we all went there to see the work. He mixed the lime, sulphur and salt; it was an ideal day, and we watched him spray. Of the plum trees, some were dead, some dying; some he cut down. This man sprayed twice, and there is no more scale there. This year we had a large crop, which we sold for two dollars a bushel. I suppose we lost about twenty-five or thirty trees before we knew what was the matter, and before we saw the State demonstration of lime, sulphur and salt.

The CHAIRMAN: I understand the Doctor to ask for any expression in regard to the demonstrations; we had them in our county. I had one on my place. Climatic conditions were against me, but the neighbors came to see the demonstration. It was impossible to spray one side of the trees; as fast as we sprayed, it blew away, and the result was that there was very little good accomplished. One of my neighbors had a young orchard which was badly infested with the Scale, and he concluded he would try it again. There was one tree that I thought was about dead, and advised him to cut it down, but he said "there is life in it yet," and took advantage of the weather, and sprayed it again, and to-day it is as thrifty a young orchard as there is in the State. We have cut out the salt, as has already been said.

MR. LUTZ: I would like to talk, but I am troubled with paralysis, and it is hard for me to speak; the paralysis has affected my speech; but I would like to hear more of the subject, because Bedford County, where I come from, is badly troubled with the Scale. One man had twenty thousand trees and they all had Scale.

The SECRETARY: This is a matter in which the Department is very deeply interested. I hope it will be freely and thoroughly discussed. What has the Department accomplished in this last year? You will realize that the Department should not expect to rid the entire State of the Scale the first year, or, in fact, that the State should do it at all. All we expected was, that the demonstrator should go over the State, and get the people interested, so as to do the work for themselves. They should know where the Scale is present, and what to do. It has been a sort of school, and we are anxious to know what results have been accomplished. I was very glad when Dr. Funk said he would like to hear. And I would like to hear from the people who have had demonstrations in their neighborhoods, or on their farms.

MR. HERR: Will not this same subject come up this evening, under the head of the Entomologist's Report?

The SECRETARY: The only reason I hope there will be considerable said on this subject, is because we have the time.

DR. FUNK: We have the people here, also, and the experts.

MR. SCHWARZ: If the demonstrations made by the experts have not been a success, it is because we could not get the people interested. I was sorry for the young man who came to our neighborhood. I gave him my orchard, and we advertised it for weeks, but we had only three people there. The most we had was eight people, and they came there out of curiosity, and not as a matter of real interest. It seems impossible to impress on the people of Pennsylvania the terrible danger that is confronting them. If it has not been a success, it is only because the farmers of Pennsylvania take no interest in it.

MR. CHUBBUCK: I would like to ask Dr. Funk, whether there is anything in the manner of operating, or whether it is that the operation itself has no effect, in a case where it didn't do any good?

DR. FUNK: It makes all the difference; if we spray right, with the proper mixture, we have a killing agent; if we do not spray right, we do not have the killing agent, and are short our time and money. In this regard I submit to an impartial demonstration. I would like to see this point discussed. If this thing goes on, in a few years we will have no farm orchards, and I think it is a most important question. Of course, if we let it come to that, it will be a bonanza to the few experts who, through time and attention, can continue to raise fruit, but I fear the farmer will only realize that when it is too late.

MR. STOUT: The Zoologist sent out a man to my place to fumigate the trees, possibly three hundred, but the results are not satisfactory—not as satisfactory as spraying. We sprayed ourselves, and we had very satisfactory results. We had been spraying before he fumigated, and he said the results would be all right, but they were not.

DR. FUNK: There is another subject I would like to talk of—fumigation. Now, we know that you can successfully fumigate a large tree, but in regard to nursery stock, it is only too often the case that the trees have been fumigated before they were sent out, and fumigated to death, so that they will not grow, and the question resolves itself into this: shall we have fumigation, or shall we not? Before I fumigated, if I lost ten per cent., I lost much; since I am fumigating, I am losing forty per cent. Why, this season I had some fine apple trees—as fine apple trees as you could find, before fumigation; since fumigating, forty per cent. of them have died. Out of one hundred unfumigated trees not one died. Now, is this not a danger? If the remedy is worse than the disease, is it not a danger? Now, the question is whether we shall not kill the whole of what we are trying to save.

MR. SNAVELY: I think the Doctor has struck the keynote of this whole business of fumigating. A large per cent. of the trees sent out by nurserymen are trees that will not grow.

MR. HERR: I want to ask the Doctor if there are not certain varieties of apples that the Scale takes to, more than others? Isn't the Ben Davis the one it takes to most of all? It is not as particular as I am; I haven't much use for the Ben Davis. But why is this?

DR. FUNK: The Scale is generally carried by some outside influence, by birds, or something of that kind. It has no wings to fly, but, of course, where the insects are carried, they stay and do their work, and it is a fact that they will take to the Ben Davis quicker than to any other kind. I think the Ben Davis has a weaker constitution, and less resisting power.

MR. SNAVELY: Dr. Funk has not, I think, touched on one important feature, and that is the summer spraying. A great many people make the mistake of putting sulphur on their trees to destroy the rot, and the next thing they know, they have no foliage on their trees.

DR. FUNK: Do I understand this to be merely in reference to the Manila or Brown Rot, or do I understand it to be also in reference to the Scale?

MR. SNAVELY: For both.

DR. FUNK: Of course, in summer spraying it is impossible to use lime, sulphur and salt, so we have to resort to other means. Now, there is nothing, in my opinion, that will quite equal a high ratio soluble oil, so far as the scale is concerned, because you can use it frequently, and still not destroy the foliage, and you will destroy all the lice, but you can't destroy all the scale at once, so you must spray every few days to destroy all that are being born. Now, as to the matter of the time of spraying: It has the same advantageous effect on the cherry, peach and plum, and we can begin immediately after the bloom drops with a Bordeaux mixture, composed of two pounds of sulphate of copper, six of lime, and six gallons of water. But during the peach season we can't use this; we must have it so well diluted that it will not affect the tree; several years ago I used on my trees a mixture made of four ounces of sulphate of copper and fifty gallons of water. You will say that is exceedingly weak, and yet, inside a week the trees did not have a single leaf on them, but they were so well developed that the fruit went ahead and ripened. I reduced it to three ounces of sulphate of copper and fifty gallons of water, and again I removed three-fourth of the foliage. The next season I used two ounces, and fifty gallons of water, and since that time I have lost no leaves. It is very weak; you could drink it without harm, and yet it has proven strong enough to kill typhoid germs, and I see it is now recommended for that purpose.

The Committee appointed to wait on the Governor reported that they have been unable to see him; he is occupied with some people from New York State; but they will return again and try to see him before lunch.

The CHAIRMAN: The Secretary's report, under the head of New Business, gives the next place of meeting; but before we proceed with that I wish to announce that the Legislative Committee will meet this afternoon right after the session, at the close of the afternoon session; members who have anything to report to them will be welcome.

MR. FENSTERMAKER: If the place of meeting is next in order, I would present the claims of my city. The city of Allentown has a great many advantages in many respects. We have excellent railroad facilities and good hotels, and you know the Lehigh County Dutch are noted for their good cooking, and you can have your choice of peanuts or beer, or both. Then, about the time of the Spring Meeting, the great cattle importer, Mr. Cooper, of Coopersburg, has his annual cattle sale. His place is easily reached by trolley from Allentown in half an hour, and we could attend the sale in the afternoon and get back in time for the evening session. It would be a good object lesson for us to see the fine cattle there that sell for thousands of dollars. These sales will not continue indefinitely; in fact, they may end at any time. Mr. Cooper reports that when he has a sale and gets good prices they raise the price on him, so that he may

not be able to get cattle from them anymore. I am in receipt of a letter from him giving us a very cordial invitation to be present at the next sale.

Then, there will be no trouble in securing a good place to hold our meetings. We can have the court house. And we have the public parks, and some large stores, that are well worth seeing, and at the other end of town there is Allentown's famous duck farm, where they have between forty and fifty thousand young ducks in the various stages of growth. I trust we shall have the pleasure of seeing you all at Allentown in the spring.

MR. SCHWARZ: I second the nomination of Allentown.

MR. SEXTON: When is this cattle sale to be held?

MR. FENSTERMAKER: Usually on Decoration Day.

MR. SEXTON: I am a Grand Army man, and as such I can't go to a sale on that day. As a Grand Army man I have other business. I march to the graves of my fallen comrades. If that is the object that takes us to Allentown I can't go there.

MR. FENSTERMAKER: That is not the object; it is merely discretionary; no one is compelled to go to this sale.

The CHAIRMAN: It is usually customary to hold the spring meeting on Decoration Day.

MR. BARNES: I wish to offer as a place of meeting, the city of York. We have a court house that is unsurpassed by any in the State, and we have first-class hotels. I therefore offer York as the place for the summer meeting.

The SECRETARY: We had the pleasure of meeting several years ago at Somerset, in the southwestern part of the State. It gave us a great deal of pleasure to have you there, and I am happy to say that it would give us pleasure to have you return there. I would, therefore, offer Somerset.

MR. McCREARY: Inasmuch as Mr. Riddle, of Butler, is anxious to have us come there, and is not present at this time, I would be glad to have the balloting held over until he can present the claims of his home town of Butler. He will be here some time today.

MR. HERR: When is the time of the summer meeting fixed?

The SECRETARY: That is left to the Director of Institutes; he fixes the time and we fix the place.

DEPUTY SECRETARY MARTIN: There is one question in regard to these meetings with which we have had considerable difficulty for a number of years. Now, in the town of Clearfield, where we had our last meeting, it was far from our desire to hold that meeting on Decoration Day, and in fact we had arranged two other dates, but found that on one of those dates it conflicted with the date of court in Clearfield, and in the other with another objection equally unconquerable, so we were between the upper and nether millstone of postponing our meeting until that time. We should have, at all

places where these meetings are held, the option of the court house or the opera house. Circumstances seemed to compel us in that direction, although we didn't want to have the meeting on Memorial Day. It is gratifying to us to have so many requests for the meeting, but that offer should always be made with the understanding that we can have either the opera house or the court house, so that we may have no difficulty in arranging the date of the meeting.

MR. HERR: I know that we can have the court house at any time we want it, if it is the desire of the board to meet at Lock Haven, which is just as accessible, and where we will be entertained just as well as at any other place, and even a little better. We have no desire to crowd out any other place, but if it is the desire of the Board to meet at Lock Haven we shall be glad to have them.

MR. SEXTON: I wish to ask the Deputy Secretary of Agriculture, in fixing the day, not to fix it on the day devoted to the memory of my fallen comrades, so that we can all attend the meeting. Now, at the meeting at Clearfield, we lost a day of good work that we should have had, by attending a memorial meeting away from home. We could not hold the interest of the people; their hearts were elsewhere, and I am sure, Mr. Secretary, that if we hold this meeting at that time again we shall have the same trouble. People want to attend the memorial services, and want to do so at home.

MR. FENSTERMAKER: I am heartily in accord with the sentiments of that gentleman, but we have memorial services at Allentown, too, and those who wish to attend them can do so, and still go to Coopersburg to the sale. And I will guarantee a hall for any date you set, if you come to Allentown.

The SECRETARY: If you come to Somerset you will find a new court house and a good opera house, to either of which you will be welcome.

DEPUTY SECRETARY MARTIN: Just a word of explanation. With the exception of one place of meeting held in Pennsylvania, we had the opera house or the court house free of charge, and it is important that we should have it free of charge. The people of Clearfield were very kind and very generous, and it was understood that all we were to pay there was to see that the janitor was rewarded for his services in the matter of light and heat. It was the same at Huntingdon, and all other places except one, and I wish the gentlemen requesting us to meet with them would bear in mind that we expect to have our meeting place free of charge.

MR. FENSTERMAKER: You will not be expected to pay at Allentown; I will guarantee a good hall in which to hold the meetings free of charge to the Board.

MR. HUTCHISON: I move that the roll be called and each member answer to his name.

Duly seconded and agreed to.

The ballot resulted as follows: Allentown, 21 votes; Somerset, 4; York, 4; Butler, 1; Lock Haven, 1. Allentown having received the

highest number of votes, was declared to be the next place of meeting.

MR. HUTCHISON: I would like to change my vote to Allentown.

MR. RODGERS: I move that we make Allentown unanimous.

Duly seconded and agreed to and Allentown was unanimously selected as the place of the spring meeting.

On motion, properly seconded, it was agreed to adjourn until 1:30 p. m.

1:30 P. M., Tuesday, January 22, 1907.

The meeting was called to order by the Chairman, Mr. Kahler.

The CHAIRMAN: If Prof. Boyer is in the room we will hear the report of the Committee on Fruit and Fruit Culture.

Prof. Boyer did not appear to be present.

The CHAIRMAN: Is Dr. Pearson here?

Dr. Pearson was not present at the time.

The CHAIRMAN: Next on the program is Prof. Butz, of State College; is he here?

Prof. Butz was not present at the time.

The CHAIRMAN: Next in order is the report of J. W. Nelson, Chairman of the Committee on Apiary. We will now have his report.

This report is as follows:

REPORT OF COMMITTEE ON APIARY.

BY MR. J. W. NELSON, *Chairman.*

The season of 1906 has been a very good one for bee-keepers. The winter of 1905 and 1906 was mild and the winter losses were light for outside wintering, the early spring favorable for brood rearing and the bad weather that followed not as severe as usual. Those who have worked for surplus honey have had good returns, while those who have worked for increase have been unusually successful, in my case amounting to fourfold, all in good condition, with some surplus honey.

There has been an unusually large number of colonies of bees in the woods this summer. I have transferred eight colonies from trees to frame hives. One of them was hanging on a tree about twenty-five feet high, and had been there about twenty-one days. I had one case of foul brood, and tried the following plan: I shook the old bees and queen out and then took the old and diseased brood to a new location. I had shaken about all the bees off, and as the larvae were badly diseased I closed the entrance for two days to keep out robbers, and then opened it just enough for one bee at a time. After seven

seven days I destroyed all the queen cells, and after a few days more I gave them a frame with a few unsealed larvae to keep them in good condition. At the end of twenty-one days I destroyed the cells on this cone and gave them some selected larvae to raise a queen from, and the built up nicely and were one of the best colonies I had when the season closed. I did not fare so well with the old bees and queen. I put them on some empty frames in an old hive for two days, and then put them in a good frame hive. I think all would have gone well, but I wanted to give them a chance to hurry up, and so put in some old combs I thought were clean. When I examined them again I had a good case of foul brood on my hands. As the buckwheat season was close at hand, I thought I would wait until then, as I find it pays to kill the old queen at that season anyway, but when the time came I could find no sign of the disease. I believe this is often the case in a flow of honey. I think the excitement caused by the unusual supply of nectar has something to do with it, but what becomes of the bacteria in the honey? Whether the disease that has done so much damage, but if I can get samples next summer I will send them to Dr. White, of Washington, D. C., for analysis.

The season closed with fine weather in September, giving us a flow of honey from fall flowers, late in the season, and plenty of young bees to go into winter quarters with. During the summer I discovered what is to me a new enemy of the bee, viz: the Cherry Bird or Cedar Wax Wing. Having heard that they were fond of bees, I doubted it, as it is often hard to get definite information on these matters. But having occasion to cut a bee tree one foggy morning, I found a large flock of these birds watching the tree, and as fast as a bee would come out they would catch it. I could see the bee plainly until it disappeared in the bird's bill. I watched them until I was sure as to what they were doing, when I tried to drive them away, but I had hard work to keep them away, as they seemed to think the bees good food. As these birds are plenty, it will pay bee keepers to keep an eye on them.

The United States government is getting very much interested in Agriculture, having carried out numerous experiments in different lines. Dr. White has been carrying out experiments with the bacteria of brood diseases. Prof. Phillips has also been busily engaged and Prof. Frank Benton has been traveling in foreign lands, mostly in Russian Caucasus, in search of new races of bees.

There are several races of bees in Northeastern Europe that promise some improvement, mostly in the way of gentleness, especially the Caucasian and Abahasian races. The former has been tried by several bee keepers in this country with varying results. It will perhaps be as well for the average bee keeper to confine his energies to the good old Italian bees, and let the specialists experiment with the new races, as they might get a repetition of the English Sparrow nuisance. There are some twelve to eighteen specimens of stingless bees in South America, but little is yet known about them.

As we now have a national pure food law, that is a bright prospect for the intelligent honey producer. There is only one drawback, viz, brood diseases. The State government should lose no time in passing a strict foul brood law. I think there should be an inspector of apiaries, with as many assistants as necessary to do the work,

that both the inspector and assistants should be practical bee men of long experience and should be appointed by and under the control of the Department of Agriculture, and be paid by the State.

Below is a list of questions sent out by the Department of Agriculture, at Washington, D. C., to the inspectors of apiaries of the State of New York:

1. How should an inspector of apiaries be appointed?

On petition of persons.

On application of bee keepers' associations.

On application of associations to their Department of Agriculture, as the State should pay for the work just the same as in the case of diseased cattle, and should therefore have supervision of the work.

2. Who should appoint the inspector of apiaries?

Department of Agriculture.

3. Should an inspector be chosen by competitive examination?

Yes.

4. What provision should be made for the removal of an inspector for cause?

If incompetent, the Department of Agriculture should remove him, but if competent he should be retained, as he will become more valuable as he gains in experience in handling men.

5. When any contagious disease is found in apiary, how long a time should be allowed the owner or manager to treat the disease?

This should be left to the discretion of the inspector, as a set rule might do an injustice.

6. If the owner or manager refuses to treat or destroy diseased colonies, should the inspector be employed to treat or destroy, as occasion demands?

Most certainly.

7. Should an infected apiary, which has not been cared for, be declared a nuisance?

It is not necessary to declare it a nuisance, as it is such, and the inspector will attend to it.

8. What should be the penalty for refusing to follow directions of an inspector to treat or destroy?

Fine

Imprisonment

One or both. Both at the discretion of the court.

9. Should an inspector be empowered to order all bees in hives without frames put into hives with movable frames in localities where disease is present?

If the inspector has tact and diplomacy, it would be all right, and if not, all wrong.

10. Should there be a penalty for concealing contagious disease from the inspector?

Yes.

11. Should there be a penalty for concealing contagious disease from a prospective purchaser?

Yes.

12. Should there be a penalty for moving bees from diseased apiaries to another part of the same State without the consent of the inspector?

Yes.

13. Should there be a penalty for moving bees without the consent of the inspector from apiaries in localities where disease is known to exist, even though no disease has as yet been found in said apiary?

Yes.

14. Should it be unlawful to move bees into another State without the consent of the inspector of the State from which they come?

Yes.

15. Should all colonies entering a State be examined by an inspector?

Yes.

16. Should there be a penalty for failing to notify the inspector of such shipment of colonies?

Certainly, or law falls flat.

17. Should there be a penalty for exposing contagious material, either honey, or appliances of the apiary?

Yes.

18. Should there be a penalty for selling, bartering or giving away contagious material, or material which has been exposed to infection, without the consent of the inspector?

Yes.

19. Should there be a penalty for refusing admission to the inspector or hindering him in the discharge of his duty?

Most emphatically.

20. Should it be declared a misdemeanor for any one, owner or otherwise, to have knowledge of the existence of disease, without notifying the inspector?

Yes.

21. Should the inspector be required by law to disinfect his person and all implements used, which would carry contamination?

Yes.

22. Should it be illegal for any person to rear queens for sale in an apiary where contagious disease exists or has existed within the same season?

He should be required to have his bees inspected, and have the consent of the inspector, twice each year.

23. Should the inspector make a public report of apiaries where contagious disease has been found, or should the report be made to the proper officials without publicity?

The report should be made to the proper officials.

24. Should the inspectors be at the expense of the State or county appointing an inspector, or should it be at the expense of the individual bee keeper?

At the expense of the State.

25. Should a special tax per colony be levied to pay the expense of inspection?

No. Should a tax be placed on each head of cattle to pay for inspection?

The above questions were sent by the Department of Agriculture, Washington, D. C., to the inspectors of apiaries of the State of New York, which questions cover the subject completely, and the answers to which I hope will meet with your approval.

Respectfully submitted,

The CHAIRMAN: What shall be done with this report?

MR. SEXTON: I move it be received and placed on file.

Motion duly seconded and agreed to.

The CHAIRMAN: Next in order is the report of the Committee on Roads and Road Laws.

The SECRETARY: Is Mr. Knuppenburg in the room? Yes; I see he is. I wish to state that we would like to have the Commissioner of Highways or his Deputy present when this paper is read. They are both out of the city today, but will be here tomorrow. Will you be here tomorrow, Mr. Knuppenburg?

MR. KNUPPENBURG: Yes, sir.

The SECRETARY: Then I move that this paper be held over until tomorrow, because there will be a great many questions that should be referred to them.

Motion duly seconded and agreed to.

The CHAIRMAN: We will take the next paper on the program, the Report of the Committee on Wool and Textile Fibres, by D. S. Taylor, Chairman.

Mr. Taylor read his report, as follows:

REPORT OF THE COMMITTEE ON WOOL AND TEXTILE FIBRES.

BY MR. D. S. TAYLOR, *Chairman*.

Your Committee would report that there has been some increase in the production of wool in the United States, as well as in the State of Pennsylvania. But there should be more wool produced in Pennsylvania, because some parts of our State produce better wool than can be produced in any part of the United States. And as we import a large amount of wool into the United States of different grades, we should produce in this country enough of wool to fill the demands of our manufacturers in the United States, and have wool for export, rather than import it.

The wool production of the United States in the year 1904 was 291,783,032 pounds; imported in 1904, 249,135,746 pounds; 540,918,778 pounds.

We take it that this amount was manufactured in the United States, as we do not find we export any wool.

The production of wool in the United States was, in 1905, 295,488,438 pounds; 1904, 291,783,032 pounds; an increase of 3,705,406 pounds.

From the best statistical reports at our command we find in the United States on January 1st, 1906, 50,631,619 sheep. Average price per head, \$3.54; total value, \$179,056,144.

Of this number Pennsylvania had on January 1, 1906, 1,102,982 head of sheep, value per head, \$4.63; total value, \$5,102,529. And on January 1st, 1905, Pennsylvania had 895,982 head of sheep; value per head, \$3.81; total value, \$3,415,394, being an increase of 206,076 sheep and of price, 82 cents per head, and of value, \$1,687,135.

The wool production of Pennsylvania on January 1, 1905, was reported as from 850,000 sheep at an average of six pounds per sheep, or 5,100,000 pounds, at 30 cents per pound, \$1,530,000.

Pennsylvania is reported as having on January 1st, 1906, 1,100,000 sheep at an average of six pounds of wool per sheep, or 6,600,000 pounds of wool; selling price advanced to 32 cents per pound, making the income from the crop of wool for 1906 \$2,112,000, being an increase from 1905 of \$582,000.

The increase of wool production in my county (Washington) of 1906 over 1905 was about 10 per cent., and an advance of 2 cents per pound. This information was obtained from wool merchants. The increase of sheep would have been more were it not for the increase of dogs in our county. Our county in 1906 paid for loss of stock by dogs \$6,505, and in 1905, \$5,656, an increase of \$849.

We had exhibited at one of our Farmers' Institutes in our county samples of fine wool grown in the locality where shown, which showed the length to be from the brood ewes $3\frac{1}{2}$ inches; sample from the stock ram, 3 inches, and from eight-months-old lambs, $3\frac{1}{2}$ inches. The standard length of staple, I understand, for fine or delaine wool, is 3 inches at one year's growth.

Your Committee would recommend to our Legislative Committee to try and have better protection from damage done by dogs to the human family and to our live stock. In our section of the State we have suffered much from mad dogs the past season. Many persons have been bitten and have been compelled to take treatment to prevent serious results. Near my home a worthy farmer and stock breeder was bitten by a stray dog; he thought it was not serious, but in a few weeks he became affected and suffered unknown agonies until death relieved him. His entire family and those who assisted in caring for him have been taken to a city hospital for treatment to prevent the spread of the dreadful disease. Much stock of all kinds in this section where this occurred, has already died, and it is expected that there are more cases developing.

The CHAIRMAN: You have all heard this report; what shall be done with it?

MR. CLARK: I move that we receive this report and place it on file.

The motion was duly seconded, and agreed to.

The CHAIRMAN. Are there any remarks on these reports which we have just heard? Probably by that time some of the Specialists will come in.

MR. WELD: I just want to endorse what Mr. Taylor said in regard to dogs. I was unfortunate enough to be a township auditor,

and from last March to November I was called upon five times to prove sheep that were killed by dogs. There does not seem to be any law to cover this, and it is a matter of interest to Warren as well as to Washington county. I think the Legislative Committee could do nothing that would benefit one branch, at least, of our live stock industry more than to better protect the sheep industry from the ravages of dogs. The unfortunate part of it is, in my section, that it is a lot of irresponsible and non-ownable curs that do this damage, and unless there is some law by which these curs can be shot at sight there is not much redress. The farmer who keeps a dog cares for him and feeds him, and houses him at night, and he knows where he is. It is the dogs that belong to people who are too poor to own anything else, that cause the trouble. They expect them to sponge their living off other people, and I want to endorse what this gentleman has just said, that it is important that there should be some restriction. We are the only county in the State under the Blair county law—

MR. CLARK: What is the purport of that law?

MR. WELD: It is simply this: That if you have sheep killed by a dog you call upon the township auditor and have him come and assess the damages. Now, all dogs are taxed 50 cents each, which goes into the county fund as a special tax to defray damages done by dogs. Now, if you have a sheep killed by a dog, you call upon the county auditors, and they come and inquire whose dog it was and assess the damages.

MR. CLARK: Well, isn't that the State law? That is the State law.

MR. WELD: I think in some respects it is different from the State law.

The SECRETARY: I think the State law provides for one dollar or two dollars, according to the sex of the animal.

MR. CRARK: Without any option for the auditors?

The SECRETARY: If the owner is willing to pay the price of the dog, the dog is saved; if not, he is killed.

MR. WELD: In our county that is not the law; if I catch a dog within my enclosure, I can kill him on sight. To illustrate this: There is a dog in our town that has been caught three times doing damage, but we can't catch him on the premises.

MR. CHUBBUCK: I have had some little experience in this line; I am a raiser to some extent, having sometimes as high as a hundred head. I am also an auditor, and I have spent many days for the dollar to prove sheep that were killed by worthless dogs. Now, a large part of the trouble in our county is with hunting dogs. They chase the sheep. They may not kill it outright, but they chase it so that it either dies from it, or is injured so that it has to be killed. They get in among the sheep and scatter them in every direction. I have had this experience within the last few days, and last year, when I was down here attending a meeting of the Board, the dogs got into the tract where my sheep were and worried them so that when I got

home I had a dead sheep on my hands. Now, the fact is, that under the State law you can't kill a dog. If your neighbor, or his cattle come into your enclosure you can obtain some redress if they do any damage, but when a dog kills your sheep, you have none. You may keep your dog law, but I tell you this: If I catch a dog among my sheep, chasing them, I will kill him if I can get him, regardless of the consequences. They ought not to be running at large at night. I had a case this fall where the hunting dogs chased my sheep until one of them died as the result of it. My hired man heard them in the night, but he didn't tell me of it, and in the morning we found them scattered everywhere and it took us some time to get them back again.

DR. FUNK: How comes it that dogs are not taxed?

MR. CHUBBUCK: They are taxed; don't you live in Pennsylvania?

DR. FUNK: I don't know anybody in Boyertown that pays tax, and the town is full of dogs. They get out of it in this way, by saying they don't own the dogs.

MR. CLARK: It seems to me that this comes up at every meeting; somebody has something to say about it. We should arrive at some conclusion so that we need not have it up at every meeting. Why is it that we are unable to accomplish anything? Our representatives should surely be able to frame a law that would be satisfactory to the people. But, now, there are two sides to the question. I had often heard of these great kennel shows, and for the past five or six years I have attended them. They were a revelation to me. You see there not only the finest animals, but the finest and best dressed and best bred people of the city of Pittsburg. They are all against anything like this; they say, "I take care of my dog; I don't allow him to go into your field, or into your yard, and yet you demand that I pay a royalty upon your sheep. I am willing to pay a tax on the dog, but when you expect me to pay a royalty on your sheep, it is going too far. I pay a tax on the dog, and then you expect me to insure your sheep." That is their side. Our side is that we want to prevent these dogs from killing our sheep. We have tried killing the dog, but I don't believe in any such demonstration as that; that ought to be a thing of the past. I believe in punishing the man, and not the dog. I believe when a man has a dog and don't keep him on his premises, except when he is out with him, we ought to make a law to punish the man so effectively that he will keep him on his own premises or kill him. Now, why can't we make a law so strong that it will accomplish this? It will satisfy the man who owns the dog, and the man who owns the sheep. What does our law amount to? Let us go back a moment. In my boyhood days, and even after I grew up, we had lots of sheep on our farms, and made money out of them; but I grew away from sheep raising. It was not because of dogs; it was because the timber was going, and we had nothing to fence in our land. Again, the timber being gone, new farming land was used, and the result was that the sheep industry died out. The man who raises sheep today can make money just the same as we did in my boyhood days. In my boyhood days, if a dog killed a sheep, we killed the dog. How is it today? You have a sheep killed by a dog and you go to the auditor and he proves

your sheep, and then you go the county commissioners, and get your money but you do not bother to go to the owner of the dog that killed your sheep. Now, why not frame some law that will keep that dog on his owner's premises? I don't want to see the man punished who keeps a dog on his farm for a good purpose, but on the other hand, up comes this thing that demands a law. Now let us get up a law that will go for these fellows and destroy this dog business that comes up every year.

MR. HUTCHISON: Let me ask you one question: How would you punish the man who owned a dog, but who owned no property; how would you punish him?

MR. CLARK: Shoot him.

MR. HUTCHISON: What, the man?

MR. CLARK: Why certainly; I would shoot him, too, if I couldn't do anything else, and feed him on bread and water.

The CHAIRMAN: Do you know that the dog gives that man more protection than you or I have?

MR. CLARK: He certainly does give him that, and a whole lot of privileges.

MR. SEXTON: We have talked this thing over year after year, until the subject has become very tiresome, and yet nothing has been done beyond making suggestions. Now, I want to add a little something in regard to sheep, and I tell you there is no domestic animal for which I have more love than I have for the sheep and its progeny, and I have seen the dogs come in and kill off my sheep to the number of twenty-five, and I know it was done by the neighbor's dogs, but I could not prove it, and had to go and get my pay. Now, is that all, to get our pay? Mr. Clark says he is satisfied to let them go under the state law. Let us try to get up a law such as he speaks of, and see what the result will be. Will the opposition come from the farmers? No; it will come from the general breeders of fine dogs, who go to these kennel shows that Mr. Clark speaks of. The only way we can keep sheep is to protect them from the dogs, and if we do not do that, these curs will drive us completely out of business. I tell you, the last carload of fine lambs that I bought at Buffalo and took down to Spring House, I put in a fine pen, well fenced, and yet the dogs got in there, and killed forty lambs in one night, and maimed a lot more. I had to send for the butcher to come and take away two wagon-loads of dead lambs. Why, I had on my farm sixty odd head of fine sheep, and they were all killed by the neighbor's dog, and the dog was chased right home, but we could not catch him, and that man swore that the dog had not been off his premises. There will never be anything done in this matter until the farmers of this Commonwealth take hold of the matter, and see that it is done.

MR. CLARK: What plan have you; in what way shall we proceed?

MR. SEXTON: Only to tax these dogs so heavily that they can't afford to have them round, and then make the fellow who takes the responsibility or the trouble, pay the fine of the irresponsible fellow.

DR. CONARD: Now, this matter seems to be discussed entirely from the sheep owners' point of view. I come from a county where

there are but few sheep, and yet it seems that where there are sheep it is detrimental to keep dogs, and where there are no sheep it is detrimental too. It is in this way: We are working under a law that authorizes the constable to collect one dollar, or two dollars dog tax, and when a sheep is killed, it is proved by the auditor, and the fine paid out of this tax. Now, since they have no sheep, they don't want to pay any dog tax, and the result is that we have dogs running around anywhere and everywhere and of a much inferior quality than where there are sheep, and they do a proportionate amount of damage. About a month ago I was called over the 'phone, and consulted about a dog that had gotten in among the neighbors' cattle, and was believed to have bitten nearly the whole bunch. He was afterwards killed, and his head sent to the University, for analysis, and he was found to be mad. I was afterwards called to the neighborhood where that dog was killed, and found four cases of hydrophobia. Now, we have the increased danger of carelessness, and you can multiply the danger of hydrophobia by two. So if we have no sheep we have trouble, and if we have sheep we have trouble. Now, there is a way to legislate these dogs into control. I am a friend to the dog, and would not legislate him out of existence, but I would legislate him into control. I think if we put a tax of from three to five dollars on every dog, regardless of sex, unless he or she was emasculated, there would not be so many dogs, but what there were, would be of good breed.

MR. NELSON: There is nothing, passing this question, that has been brought up today. We hear a great deal of the sheep side of the question, but in our towns and villages it is customary to have low fences, and in the town where I come from—Clearfield—there is a great deal of talk about dogs doing damage in the yard. At State College I saw the campus covered with dogs, and it is the same way in our town. Now, what about the danger of hydrophobia? How about the girls and boys who have suffered the torture of hydrophobia from the dogs? I think if you will turn to the report of 1903, you will find on page 212, a resolution that is fair to all parties. Now, Brother Jackel and I have never found anything that covers all points as this resolution does, and we think that the influence of this Board should be used with the Legislative Committee to get this law passed. I want to be fair to the dog: I keep a Scotch Collie myself, but I keep him in a nice cage, and still, every night, I find my porch covered with dogs, and something should be done.

MR. TAYLOR: This gentleman has touched the danger line. The danger is to the sheep, to the horse, to the cattle and to the children. In our village one Sabbath morning, a dog strayed out and went into the town and bit all the dogs; next he attacked the chickens, and then a little boy who tried to take him away. He was killed, and his head sent to Pittsburg, and they directed that all the animals he had bitten should be killed at once, and the boy sent away for treatment. In our little town we have sent away six persons for treatment in the last six months, and for the sake of our loved ones, our fathers, our mothers, our sisters and brothers and children, I think that some action should be taken. I think that you men who are in the Legislature, and who have been in this Board longer than I have, should be able to draft something that will do the work.

But the trouble in our section of the State is, that we can't find the owner of the dog. I have been a Justice of the Peace for a number of years, and I have known fifteen cases where they never reported the owner of the dog. We have talked with the people, but we have never found the dog that did the damage.

MR. BLYHOLDER: There is another phase to this question, to which this gentleman has just referred, and that is, to find the owner of the dog. I know that in the section of country from which I come the same trouble exists, to find the owner of the dog. The assessor comes along, and sees the dog, and he says "whose dog is that?" and the man says "I don't know who he belongs to," and that is the way in every house in the village. Now, I think the assessor should furnish a tag to every owner of a dog, and every dog found without a tag should be killed.

The SECRETARY: Should not that be the tax collector?

MR. BLYHOLDER: I also had a good many sheep killed by a dog, and the dog was never found. Now, I think the assessor should furnish the tag, and the owner be compelled to put it on in the presence of the assessor, and whenever a dog is found that has no tag on, he should be killed at once, right then and there. You know, in our district the tax collector does not come around any more; the tax is brought to him; so I don't see how he could do it. It seems to me that the assessor is the one who should do it, and he should furnish the tag, and have it put on in his presence, and every dog that is found without a tag should be killed at once. I had a very excellent sheep farm up to three years ago, but I had to sell off the farm and the sheep. The dogs made it simply impossible for me to keep them.

MR. BOND: Finding the owner by the dog; what good will that do, if you can't find the dog? I have a way of finding the dog and the owner; I know the dog, and then I catch him, and find the label. I have two on my hands now.

The CHAIRMAN: It seems to me we should not discriminate in favor of the dog. I have a horse, and I must take care of him; I am not supposed to let him roam around all over my neighbor's property. Why, a dog has more privileges than you or I have. If I go on my neighbor's property, I make myself liable to an action for trespass. If a man wants to keep a dog, let him keep him in, and not allow him to run around, biting people and stock.

MR. CLARK: I think I can agree with both Brother Bond about identifying the dog, and with Brother Blyholder about identifying the tag.

MR. HUTCHISON: There is a gentleman here from York State; they have a local law there in his county, on which I would like to hear from him.

MR. VAN ALSTYNE: I did not want to get into this discussion, although I have been an interested listener to it. We have a local law, that is just going into effect, and it requires that during this

present month of January every owner of dogs shall apply to the town clerk, and register his dog, with the discription, and pay a fee of two dollars, and the town clerk then issues to him a tag with a number on it corresponding with the one entered into the book, and every dog that is not so recorded during this present month of January has no standing, and the owner who shall fail to register his dog is guilty of a misdemeanor, and may be imprisoned.

MR. NELSON: I want to say to Brother Blyholder that the resolution I have referred to, makes it obligatory upon the constables to report that they have killed all dogs found in their bailiwick without tags.

MR. VAN ALSTYNE: I might add that if a man fails to register his dog, he is liable to imprisonment, and his dog is killed. Now, the trouble in regard to having the constable kill the dog, is that the constable is generally a candidate for re-election, and does not care to go around killing his neighbor's dogs.

The CHAIRMAN: Why not let anybody do the killing, instead of forcing the constable to do it?

The SECRETARY: I move that a committee of three be appointed with Brother Clark as Chairman, to formulate a bill to be presented to the Legislative Committee for presentation to the Legislature.

Motion seconded and agreed to.

The CHAIRMAN: I will appoint on that committee Messrs. Clark, Blyholder and Critchfield.

The Committee appointed to await on the Governor reports progress. The Governor is very busy, and his whole time will be taken up to-day, but he has signified his willingness to be with us to-morrow morning at 10 o'clock.

The CHAIRMAN: We will hear from Mr. Van Alstyne on "Building up a Dairy Herd."

The following is the address:

BUILDING UP A DAIRY HERD.

BY MR. EDWARD VAN ALSTYNE, *Denmark, N. Y.*

I want to talk to you in a very practical way, to, I presume, a company of very practical men. I suppose the aim of this address is that we may obtain a more profitable cow in our dairy. And in what I have to say to-day, as well as to-morrow, I wish you to understand that it is not to the wealthy man, the man with unlimited

means at his command to purchase the very best that money can buy, that I am talking; he is not the man I have in view at all; he is a very popular factor in society, but the man whose every wish is obtainable is not the man I have in sight. It is the ordinary man, like myself. I say this because I think it will be best for us to clearly understand one another

I think that we to-day want a better dairy cow than ever before. I say that, because I fear in many instances the farmer is keeping his cows with but little profit. What is the profit on the dairy cow? Is it that she simply pays for her keep, and makes a minimum of profit? That is not going to pay off the mortgage, and clothe the children, on the farm. The first thing we expect of a cow is that she will pay interest on the money invested in her. If we take three or five hundred dollars to the savings bank, we get three and one-half per cent. interest, without the trouble of working for it. If we put it out at interest, we get from five to six per cent.; as you increase the risk, you increase the interest. When we invest it in a cow, three and one-half per cent. is not enough, nor five, nor six per cent., because we are not sure that we can get it back when we want it. I find that in a herd of twenty-five cows it is necessary to replace at least five each year to keep the herd in good condition. Some of them may go barren, and some of them may lose part of the udder, one may die. So I figure that on the money invested in the Dairy Cow, I should have at least ten per cent. to equal the interest on the same amount of money invested elsewhere. So if we pay fifty dollars for the cow we should have at least five dollars profit on her. The next practical thought is her feed. As I said before, she should pay for her keep before we begin to make any profit on her. And the labor; what does it cost to milk her three hundred days in the year, Sundays and holidays included? At least ten dollars more on that. So I figure that I must have at least ten dollars over and above the cost of her feed, and the interest on the money invested in her, before I begin to make money on her.

Now, we have to have a better dairy cow, and I am very sure that it is not of any particular breed. A man starts out thinking he is going to make money right out of this particular breed, or that one. Now, let me say that each particular breed have their use for special purposes. I want to make myself clear on this point, because you may infer from what I say later on, that I am not a believer in pure bred cattle for the ordinary man. Yet I am a most firm believer. I believe firmly that all the best things we have in our dairy herd to-day are the result of careful breeding. We will take the superb Holstein, which for two thousand years has been bred in Freiland, Holland, where she is given a large amount of rather bulky feed, with a view to producing large quantities of milk, without reference to quality, and in which purpose they have succeeded. The Holstein will produce a quart of milk—regardless of its interest—on the feed given her cheaper than any other cow. Then we will take the Jerseys and Guernseys, bred on the rocky Channel Islands, milk high in fat and other solids and yellow, more scant in quantity than is that of the Holstein. They have been bred not so much to produce a large quantity of milk, as to produce one high in fat with a large globule, easily churned when made into butter. They have

succeeded in that as the Holstein breeders have succeeded in their object. The Channel Island cattle produce a pound of butter cheaper than any other cows on earth. Not only because she produces butter cheaper, but because she produces a better butter. That is where many have fallen down. At the Buffalo Exposition it cost for food, for the Holstein cattle to make a pound of butter, about twelve cents. The Channel Island cattle, butter for food costs about nine cents. You can't improve on the cream or butter of the Channel Island cattle, because they are bred for that purpose. I will illustrate this: Those of you who were at the Exposition will remember that we had a small dairy-room which was often at a temperature of seventy degrees. On those hot days we took the cream from any other breed than the Channel Island cattle, and churned it at 60 degrees, we had grease pure and simple. We had to take such cream and reduce it to a temperature of forty, and then churn it for two hours, before we had butter, and then we often had to set the butter away for twenty-four hours before it was hard enough to print. We could take the cream from the Channel Island cattle, churn it at between fifty and sixty, take it out of the churn and print it and set it up on the form no matter what the temperature. Therefore I say that the Holstein is not the cow for the man who wants to make butter for market. The man who wants rich milk or who wants to make butter is a very foolish man if he attempts to make it from any other breed than those bred for that purpose. But there is a cow between the two, the Ayrshire, from Ayr, in Scotland, where they have not so much feed to give her, and she has had to hustle for her living. She gives a large supply of milk, with about four per cent. fat. For the man who wants a good milk, and fair quality, where the feed supply is not abundant the Ayrshire is the cow. Again the man who wants to make beef is very foolish if he attempts to make it from any other breed than those bred for that purpose, such as the Shorthorns or Hereford. You see I am not a believer in the dual purpose cow. You say you want a cow on which you can make a little on the milk, a little on the butter, and a little on the carcass, but you can't do that and not lose in every respect. I will take for illustration, the Holstein, the extreme dairy breed, and the Hereford or Shorthorn, the extreme beef breed. We will put both on the market, both equally well fed, and weighing the same, and the Hereford will bring from one-half cent to one cent per pound more than the other. Why? Because the Holstein is developed in the lower portion of the body and the other up where the cuts are worth the least, in the back and loins. Again, the man who attempts to use the beef cow in the dairy, is as foolish as the man who would hunt birds with a bull dog. Get cows of the type that will fit your needs. "I thought," you will say, "you said you were going to talk to the average farmer, and now you tell us to go to an importer and buy our stock." Yes, if you have plenty of money which most of us haven't.

We have come to the point where most of us realize that we must have a better dairy cow, and that a cow that has been bred for a particular purpose. What shall we do? We go to a man who has good pure bred cows for sale, and select some that we think will answer our purpose and find that they will cost from one hundred

and fifty to two hundred and fifty dollars each, and we can't afford to take them. The animals are worth it, but we simply can't afford to pay the price. What then? We have our heads set on pure bred stock, and we go down the line until we find something that fits our pocketbook, and we say "these are pure bred?" And they answer "Oh, yes." "They are registered?" "O, yes." And we buy them, and take home the man's culls. He wouldn't have sold them at that price if they had not been culls.

I repeat that these animals have been bred for the particular purpose for which we want them. When we have made up our minds we want a large supply of milk, and have plenty of feed, then we take the Holstein; if butter, then we take the Channel Island cattle; if better milk, and hilly pastures, then we take the Ayrshire, and if meat, then we take the Hereford or Shorthorn. A good cow is cheaper at sixty dollars than a poor one is at ten. I am going to describe the requirements of a good cow a little later. With the best grade of the particular type desired, we will get a bull of the breed we want. Let me emphasize the importance of a good bull. The importance of pure breed. I don't think we emphasize that as we should. When we consider the breeding of animals, the strain of the sire should be very carefully noted. Why, gentlemen, what is a pure bred animal? It is simply one that has been bred in a certain line so long that the type has become fixed. There is always a tendency to go back to the characteristics of the ancestors, and the better these characteristics and the longer they have been bred, the nearer we get to the animals that we want, and the more certain we are of producing the tendencies of that line. The more we breed, indiscriminately, the more likely we are to go back to the original tendencies. To illustrate this, let us take the human family, and go right back to the Jew. Since the days when Abraham went out from Ur of Chaldea and went whither he knew not, down through the centuries, there has been the Jew, and to-day when for more than two thousand years he has had no country, he is as separate and distinct as he was four thousand years ago in Palestine. You can pick him out to-day by his facial characteristics, and by the same characteristics which Jacob exhibited when he entered into that cattle deal with Laban, and in Joseph, when he got up that corner in grain. Scan their names; you will find them foremost in finance, in music, in trade and in politics. They are masters in whatever they undertake. Why does the Jew succeed in spite of the persecution he has endured? Because he is smarter than the other fellow. It is just this: The marriage of Jew with Jew, the breeding of the racial characteristics, until we know to a certainty when we see a Jewish family, that the child is going to be the same Jew that his parents are.

And this is the way our type of domestic animals is fixed. You will buy a sire of the best breed. I believe it is more necessary for me to have a good sire in my herd of grades, with his breeding capacity proven, than it is for my neighbor, who is breeding pure breeds entirely. He has a pure blood in his cows. You get a grade sire, the descendant of pure breed on one side, and of anything on the other; you breed him with a good cow, and you say he will reproduce the traits of his pure breeding; how do you know this?

There is always a tendency to go back to the traits of the ancestors, but how do you know he will not reproduce the bad traits, instead of the good ones? He is just as likely to do so.

Then comes the cross-bred, the result of breeding two pure breeds together. For instance, I will take a Holstein that gives plenty of milk, but it is not rich, and I will breed him with a Jersey who has plenty of richness, but not so much milk, and then I will have the excellencies of the two? What is the result? I get the quantity of the Jersey and the richness of the Holstein. It is the old story of avatism, the going back to the original tendencies of the ancestors. Darwin in his "Origin of Species" claimed this, and made the statement that all breeds of pigeons could be traced back to the old Blue Mediterranean pigeon. To prove it, he crossed the Pouter and the Fan Tail and what did he get but the blue tail feathers of the Mediterranean pigeon. We see the same thing in our cross breeding. When we bring together two pure breeds, we increase, for some unknown reason, the tendency to get the bad qualities of both lines. I can bring that right down to you. It is not the simon pure negro that causes the most trouble; it is the mulatto, who develops the worst traits of both his black and white ancestors. We have the same thing in the Indian. Up in New York, we have not many Indians, but we still have a few, who are a conglomeration of the old Six Nations mixed with whites, combining the evil traits of the white blood in them, with the same traits of their red blood. They are the laziest and most shiftless beings on earth. They won't work if they can beg or steal. I could not help, at the Exposition, but compare them with the real simon-pure Indian of the plains. You know they had an Indian village there. These were dignified, a fine type of pure breeding, the other, the evil product of the two races. Perhaps I am spending too much time on this, but I realize the importance of it.

We had first the grade sire, then the cross-bred sire, but what we want is a pure sire. So we get one, and use him with the herd, and if his calves are what they should be, and he proves to be a good animal, we will keep him just so long as he is serviceable. There is more deterioration to be laid to the yearling than from most any other cause. We want the strength and the stamina of fully matured ancestors. I prefer to have a bull eight or nine years old; I never know just what he is going to do until he is four years old. I sacrificed one of the best bulls that I ever had when he was three years old, and never knew it until his daughters came to milk. So I have learned to keep my sires just as long as they are serviceable. With grades, I would use a bull with his daughters. You will say that is incestuous breeding. That is true, but when we bring these two lines of blood together we get three-quarters of the line-blood that we want. If there are no weakness in either sire or dam there will be little to fear from such a course. And when we buy again, buy a bull that is bred along that line. That is where many a farmer makes a fearful mistake; he would like a little more size, so he takes another breed to get it; he would like a little more butter so he goes to the Jerseys to get it, and perhaps he would like a little more beef, so he goes to the Hereford to get it. He is like the woodchoppers; they were Canucks, their work was cold, and

they generally wanted a little something to warm them up. On one occasion they tried to tell the landlord at the tavern what they wanted; they didn't know the name, so the Canuck said: "You take a little whiskey to make it strong, and a little water to make it weak; a little lemon to make it sour, and a little sugar to make it sweet." "Oh," said the landlord, "that is a flip." And so it is with our farmer. You get a little Holstein for the milk, and a little Jersey for the cream, and a little Shorthorn for the beef, and you have a "flip" every time, and if I want to see poor cattle, I will go to the place where they have followed this course.

When I went into breeding, I raised all my heifer calves. But there was something wrong; I didn't get results; so I said 'I will have to be more careful,' and I selected them only from the best cows, and I got nearer what I wanted, but I still drew a good many blanks, until I began to examine the calves themselves. Now it is a fact that a good many heifer calves fail to be as good as their dams. Do you ever think how much we ask of the dairy cow? We ask her in twelve months to support herself, to reproduce herself, and give us an amount of milk often equal to the weight of her body. Now, I have begun to examine my calves, and I find a calf that is weak, and anemic, I don't try to raise it, and this you can tell by looking at the calf. Open its mouth, and look at its teeth, and if you find only four of the milk teeth, that calf is not worth raising. Why? That mother had too much of a strain on her, and she was not able to put strength and stamina into the calf she was raising. I have raised some of these calves, and they have always been a disappointment. Then I examined the udder and the teats; one of the tests of a good udder is to have the teats placed right. This fall I was a judge at a fair up in my state, and a man brought in a heifer. She was a fine Jersey, and I thought "that is a prize winner, sure," until I examined her udder and found two of the teats joined together. I asked him why he raised her, and he said he had never looked at that; he had never seen it.

Now, when a calf passes muster, then we keep it, but do not forget that their value as cows will depend largely upon their treatment for the first two years. They must be well cared for. After the first few months it is better to turn them out and let them work a little for their feed; it helps to develop them. They should have a large stomach, for it shows great storage capacity, even if it makes them appear pot-bellied. They must have a place where to carry the feed. I was at Moorestown, New Jersey, last winter, to see a herd of cattle that were large producers. I saw nothing abnormal about the cows except that they all seemed unusually large, and that many of the two-year old heifers were larger than those two and a half and three years old as usually seen of that breed. I could not understand it until they told me that they fed those calves on milk until they were a year old.

Now, then, we have selected our stock, and are breeding along that line year after year. We have found what we want, and we will go on breeding along that line, and in ten or twelve years we will have a herd that is nearly equal to pure bred. They are really pure bred, only they can't be registered. When we are adding to our stock we will get in one or two good pure bred females, and at

the end of ten or twelve years we will have a herd of fine, pure bred stock, and when we come to sell them we can get better prices for them.

Now, all good cows have certain points. What are they? To show them I have had the picture made. It is a very fair picture of a good grade cow I had. First, let us see the characteristics of the cow of way back. Now, the cow that Adam had after he left horticulture, was not much of a cow. What was she? Well, she was fitted for her work. She had to live out in the jungle, and fight for her existence with the wild beasts, and it was a case of the survival of the fittest. She had to fight her way through the heavy brush and overhanging trees. Let us see her characteristics: A small barrel, for she had only what food she found closed ribbed for protection; a small udder; a short neck and heavy horns, characteristic of the fighter. We should call that a very sorry cow, but she was probably the best suited to the times and her environment. Now, as to the points of the good cow: We can not fail to be impressed by her girth through here (the body), by the large nostril, and bright eye. The animal that has a prominent and snappy bright eye is the one that is likely to have a good constitution. The large wide nostril means a good pair of lungs; and a heart that is doing its duty. Then we have the thin head, with light horn, and prominent, pointed shoulder; the sharp, not flat back, widespread at the haunch, to insure easy delivery of the calf; ribs well set; high pelvic arch, long tail. What has the tail to do with it? Only this, that the tail is the extension of the spinal column, and a long tail indicates strong nerve force.

We can just as well breed good udders and easy milkers as the contrary. I have to-day descendants of the fourth generation of easy milking cow, and they have all more or less of her tendencies. Then I have two or three heifers descended from a cow that was not an easy milker, and I don't raise any more of them. Life is too short.

Then comes a large, crooked, milk vein. Some people are rather inclined to ridicule that, but I have found it a good test. It shows the flow of blood from the udder to the heart. Now, when there is not much milk, there is not much blood there. What I lay most stress on is the hole in the end of it; if the hole is large, it indicates that it is built to carry plenty of blood. We will probably find this larger on the left side than on the right. These are always things that are present in a good dairy cow, and they are characteristic of a good dairy cow. We find the same characteristics in the sire.

I want the head and the neck to be thin. I want him to have the same arched spine, and the same contour here as in the cow, and I want to find four good, rudimentary teats in the sire, which are well placed. I lay great stress on their being placed, because the sire reproduces himself, and you will find four times out of five that the teats of the heifer are much the same as the rudimentary teats of the sire. Then I like to see a good milk vein. Then I take the loose skin at the flank and stretch it; if it stretches out long and flexible, it is a good indication of the udder on his heifers. I was judging at a fair up in Washington County, my state, and there was a farmer there who was in the habit of carrying off the prizes each year, and I gave him a premium for one or two of his cows, but none for his

heifers, and none for his sire. He came to me and said, "I wish you would tell me why you turned down my bull and my heifers;" well, we brought out the bull; I could not find in him any of the rudimentary lines. He said he never knew of the existence of anything like that. Then we looked at the heifers; not one of them had an udder bigger than a sheep, and he said he was disappointed in them, but didn't know the reason. He didn't take offense at being turned down, but declared his intention of trying to breed along the lines I had pointed out to him. In this case, the sire had simply reproduced himself.

I want a good bull with good ancestry; the best I can get; but when we get to a place where we must choose between a bull with a good registered ancestry of performances and is not himself a good specimen, and one who is a good individual, I would rather have the bull that has the record of performance every time than the one with no known ancestry, but a good individual. Keep a record of his milk strain and breed from that. Give me a bull with an ancestry of producers, and he will produce himself in his descendants.

Given these things, I know we can develop a herd of better quality, and better producers than we can in any other way.

The CHAIRMAN: We might devote a few minutes to the discussion of Mr. Van Alstyne's address.

MR. RODGERS: What effect would it have on the cream where a farmer keeps one-half Holstein and one-half Jersey cows. Would it churn together properly?

MR. VAN ALSTYNE: Yes; there would not be so much loss if separated by machine. Of course we know that cream passes in the separator as rapidly as the gravity allows, and the butter globules would not be mixed with those of the Jersey, and it would not turn out quite so rich. And there is another point: what makes a good ration for the Holstein will not make a good ration for the Jersey. So I would rather have them one grade. Now, a man may have to keep a Holstein and a Jersey if he sells the milk, to make it a little rich. I have heard people say that the butter of the Holstein was of excellent flavor, while that of the Jersey was not so ideally flavored. That is not so at all. It is due to the feed, and to the manipulation of the cream.

MR. McCREARY: A yellow skin on the animal, would that count in its favor?

MR. VAN ALSTYNE: A yellow skin on a Holstein as well as on any other animal will be a good indication that there is some butter fat there, but it is not always a sure indication. Now, for instance, the Guernsey cream is more highly colored than that of the Jersey, yet the Jersey has the richer skin, but has not, consequently, the richer cream. A better way, I have found, is to turn back the ears, and if they are oily, and to look again at the shoulder, and again at

the end of the tail, and if you find there an oily substance, the milk will be pretty sure to be rich in butter fat.

The CHAIRMAN: Do you consider the Ayrshire a good dairy cow?

MR. VAN ALSTYNE: Yes, I do. When a man wants a cream of $4\frac{1}{2}$ per cent., or a little better, present, I believe that the Ayrshire is better for that purpose than any other, but it seems to me that she is not as highly appreciated as she should be. I suppose the reason for that is that she has been a good cow, and they have been satisfied to keep her, and not attempt to put her to the front.

MR. HERR: Is it not one objection to the Ayrshire that her teats are very slender, making her hard to milk?

MR. VAN ALSTYNE: Well, yes; the Ayrshire in Scotland is milked by the women, and time is not valued, so that the teats are very slender, but in the last ten years her teats have been very much improved.

MR. SNAVELY: Is not the Ayrshire coming to the front during the last few years?

MR. VAN ALSTYNE: I want to say this; and I don't want any one to think I am opposed to the Holstein, because I think the Holstein is the best cow in the country to-day, but I have seen a good many indications in our country, where they make cheese to a large extent, that would seem to show that the Holstein is taking second place. I should be sorry to see it, but just as sure as the sun rises to-morrow morning, in a few years you will see the Ayrshire displacing the Holstein in our country.

MR. CHUBBUCK: How about the Brown Swiss? She is a good cow, and some of my friends here are perhaps aware of it; she gives as much milk as the Holstein, and nearly as rich as the Jersey, and has a heavy carcass. I don't believe in going abroad, when you have your choice of the best at home.

MR. HERR: I should like to say that if there are any other credentials, I should be glad to have you hand them in now.

The SECRETARY: Prof. Van Norman wants to make an announcement.

PROF. VAN NORMAN: I merely wish to say that we have about completed arrangements for the demonstration of our milking machine. The cows are here, and we will have a demonstration at eight this evening, at ten to-morrow morning, and at four to-morrow afternoon.

MR. FENSTERMAKER: Will it not be possible to get off some more of the reports? There will be a fearful amount of ground to cover to-morrow.

MR. SEXTON: I move that we adjourn.

Properly seconded, and was agreed to.

Tuesday, January 22, 7:30 P. M.

The evening session opened with Vice President S. M. McHenry in the Chair.

The CHAIRMAN: Is Prof. Cochran of West Chester here?

The SECRETARY: I have not seen him to-day, and don't think he is here.

The CHAIRMAN: Next in order is the report of Dr. Groff; is he here?

The SECRETARY: Dr. Groff is not here, but his report is, and can be read, or received and placed on file, as desired.

It was moved and seconded that the report be received and placed on file, for publication with the other reports.

Agreed to.

The report is as follows:

REPORT OF HYGIENIST.

BY DR. GEO. G. GROFF, *Lewisburg, Pa.*

Tuberculosis, Typhoid Fever, and Cancer are the three germ diseases which now claim the greatest number of victims in our State. Beyond a doubt, all are communicable from person to person.

Tuberculosis is common to man and many of the lower animals, though it is doubtful if it is often communicated to man from these lower animals. The reason of this seems to be, that the temperature of the common domestic animals is higher than in man, so that when the germs find their way into the human body, they fail to live and multiply in the lower temperature of the human body. The cow, sheep, hog and poultry are all subject to Tuberculosis, and any animal known to be affected, should not be used for human food, and in the case of affected cows, they should not be kept in dairies, but should be removed and killed.

Whenever an inmate of a family is stricken with this dread disease, or whenever any signs of the disease appear, an outdoor life should at once be entered upon. Such person should live out of doors day and night. He should get all the fresh air, milk and eggs possible in the twenty-four hours. The germs of the disease are eating his body up. The air, milk and eggs are prescribed in order, if possible, that they may build up the body, more rapidly than the germs destroy it, and sometimes the treatment succeeds. There is almost no use to use medicine for the disease. Care should be taken that no one else in the family takes the disease from the sick person. He should never spit upon the ground or upon a floor, but into a

paper napkin which should be burned. The ordinary handkerchief is dangerous is used to receive the sputum. One sick with tuberculosis should not be employed in the dairy, for he may infect the milk with his hands, or the straw of the stable with his sputum, which when dried, may get into the milk, where the germs live and multiply. The tubercular patient should have his own dishes, which should be washed separately from the other dishes of the family, and articles of food which he does not eat, should be burned, or buried deeply in the ground. After a death from tuberculosis, the room and all that belonged to the patient should be most thoroughly disinfected. The sick-room should be exposed to the air and sunshine so long as possible before it is again used.

People do not inherit tuberculosis. They may inherit constitutions which are susceptible to that disease, and so we often see several cases in the same family; not because the disease has been inherited, but because it has been communicated by the first case to the others.

Typhoid fever is also a germ disease, communicated most commonly through food and drink. These become contaminated and infected by more or less carelessness. Thus, faecal matter is too often allowed to enter water which may be used for domestic purposes. Sewers commonly discharge into streams which lower down are used for drinking purposes. Privies are generally too near wells, and often on higher ground, so that it is entirely possible for drainage on the surface, or underground, to exist directly in the well or spring. If the discharges from a typhoid fever patient enter drinking water, it is almost certain that some of those who use the water will contract the disease. If such water is introduced into milk, the disease may be in that way spread, for these germ flourish in that fluid. A person suffering from a mild form of typhoid fever, may, in milking or in cleansing the utensils in a dairy, infect the milk, and epidemics have originated in this manner. Nurses, in handling the sick, have their hands infected and unless they are very careful, they will infect food and drink. The person who nurses one sick with typhoid fever, should not, if possible, cook for the family. Every time she handles the patient, she should most carefully wash her hands. One sleeping with a patient with typhoid fever, may readily contract it. So, also, if there is carelessness in a family with the discharge from a sick person, the germs may get into the house, dry up, spread about, and many persons come down with the fever. With the utmost care, the disease can be confined to the person who first takes it. There is no need to quarantine a house with typhoid fever, and there is no need to keep the children home from school. It is well to tie the pump handle, when, in the country, a funeral occurs from typhoid fever. The water is dangerous to use. It should all be pumped out, a pound of copper sulphate thrown into the well, left there for a day, and the well again pumped dry.

Cancer has become one of our most prevalent diseases, as well as one of the most fatal. There is no idea that it is inherited, but it distinctly follows in certain families, for the same reason that tuberculosis does. There is no proof at all existing, that any foods, animal or vegetable, in any way cause cancer. Cancer has been ob-

served in the eye and salivary glands of the cow, and in trout in propagating tanks, and in rats and mice, in the latter in the mammary glands.

From studies recently made in the State Cancer Hospital, Buffalo, New York, it would seem that beyond a doubt, rat and mice cages may become infected with cancer, healthy animals placed in such cages contracting the cancer. This would lead to the inference that rooms in which cancerous patients live may become infected, and so the disease may be spread. It would be well in all these cases to thoroughly disinfect all articles used by such patients, and on their death to most thoroughly cleanse and fumigate the room. A point brought out in the studies of cancer in rats, was, that one cage remained infected for a period of three years, no rats having been in it in all that time.

No germ has yet been discovered for cancer, but it is generally thought to be caused by a minute animal germ.

It is now generally recognized that the Grippe and ordinary "colds" are "catching." In the writer's family it has been noted now for a good many years, that if one member of the family has a "cold," one after another "catch" it. Sometimes, however, one or two members of the household escape. At the State Sanitaria for Tuberculosis, it has been observed that colds become epidemic. The same is frequently seen in schools. By exercising care with the sputa, these diseases may be restricted, possibly to those who first contract them.

The CHAIRMAN: Prof. Surface is next on the program. We shall now have the pleasure of listening to him.

PROF. SURFACE: Mr. Chairman, by a mistake I made this evening, I brought the report of the Ornithologist to-night. I have prepared some specimens of insects which I wish to use in the report on Entomology, and which I have not with me. If, therefore, there is no objection, I will give the report of the Ornithologist at this time instead of the report of the Entomologist.

The CHAIRMAN: If there is no objection on the part of the members present, we will listen to the report on Ornithology to-night, instead of the report on Entomology.

No objection being made, Prof. Surface read his report as follows:

REPORT OF THE ORNITHOLOGIST.

BY PROF. H. A. SURFACE, *Harrisburg, Pa.*

The past year has been one of unusual interest in certain features of bird life in Pennsylvania. In the beginning of the season for migration the Blue Bird came north early, and after their arrival snow came and remained on the ground until thousands of Blue Birds were starved, and the dead or dying remains of many were

found. This materially decreased the number of Blue Birds nesting in this State during the summer. Several reports sent us from Lancaster, Dauphin and other counties, concerning Black Birds picking large holes in growing English Walnuts before they were half grown. This did not appear to be for food, and the suggestion has been made by Mr. Gabriel Hiester, President of the State Horticultural Association, that it may have been to use the bitter juice of the English Walnut as an insecticide for their parasites, as he noticed them picking the walnuts and then preening their feathers.

Unusual complaints have been made against the English Sparrows, especially for their damage to peas growing in gardens, which they pulled as soon as they appeared above ground, and of which they also ate into the pod before the young peas were ready to pick. Much complaint has also reached us of English Sparrows eating the buds of fruit trees, and if legislation could abate this nuisance, we should be heartily in favor of it.

The statements have come to us that the Wild Pigeon has been several times in the northern and mountainous parts of this State, and we have a letter recently received upon this subject, stating that a wild pigeon was seen nesting on a stump last summer.

We wish to speak in some detail of the stomach contents of various species of birds that have been sent to the office of the Economic Zoologist during the past year. Among these are the following:

The Horned Grebe.—We have received and examined the contents of six specimens of Horned Grebe and have found sand and vegetable matter in practically all. In three there were fragments of Black Beetles, probably the so-called Whirligig Beetles, which live on the surface of the water.

The Blue-winged Teal.—A Blue-winged Teal was found to have fed upon aquatic snails or mollusks, seeds of *Polygonum* or smart-weed, and other weed seeds.

The American Black Scoter.—An American Black Scoter was found to contain a mussel-shell 5x2.5 centimeters, another small bivalve, and fragments of other bivalves, showing that it is decidedly a mollusk-eater.

The Coot or Mud-hen.—Several specimens of Coots were examined and all were found to contain white sand and vegetable fibres, while one had eaten a large number of small snails. However, the evidences are that it is to a great extent a feeder on aquatic vegetation.

The Bittern or Indian Hen.—The stomachs of two Bitterns were examined, one of which was empty, but the other contained one of the night-flying moths, the remains of a cricket, and the spines and fleshy tissue of a caterpillar, probably the destructive Woolly Bear larva. The stomach of this Bittern was lined with the bristles of such insect larva. This is a new and interesting point for the Bittern. It also contained the seed of Spanish Needles. Thus we see this aquatic bird, which is too often shot by gunners, is justly protected by the law.

The American Goshawk.—In the fall or early winter there was an unusual southward flight of the American Goshawk, or Blue Hen Hawk, which nests mostly northward and comes into this State only in the winter. Of four Goshawks examined we found the

stomachs of two contained feathers, probably of small birds, and one with chicken feathers. In fact, the last-named was caught by a steel trap set upon a chicken which it killed. This is one of the serious enemies of rabbits, ruffed grouse, quail, and domestic poultry, and is not protected by law in this State.

The Red-tailed Hawk.—There has been much discussion about the protection of the Red-tailed Hawk, as it is one of the birds that can not be killed legally at any time in Pennsylvania. This law is commonly violated, but we have seen enough to justify its preservation. For example, in one Red-tailed Hawk we found two red-legged grasshoppers, the head of a chipmunk, and two specimens of field mice. Another contained the upper and lower jaws of a field mouse, showing plainly that it was beneficial in its feeding habits.

The Red-shouldered Hawk.—This is another bird justly protected by law at all times. In the stomach of one was found a mass of hairs of a mouse, and in another were found two specimens of a short-tailed meadow mouse, or mole, and also a red-legged grasshopper. As this is the mouse that destroys trees by gnawing their bark to such an extent during the winter, and as the red-legged grasshoppers are the most destructive Pennsylvania insects of their Order, we can understand why the Red-shouldered Hawk should be preserved.

Cooper's Hawk.—In the stomach of one individual of this species we found the remains of a chipmunk and part of a small bird. In another was found a few small white feathers, showing that it had eaten a small bird, in another flesh and feathers of a chicken, showing that it was destroying poultry. This record does not entitle it to protection.

The Great-horned Owl.—In one Great-horned Owl we found feathers and bones of a chicken, and in fact, this bird was trapped when trying to get poultry. In another were the feathers of a small bird, giving evidence of the justice of the law permitting the Great-horned Owl to be killed at any time. However, we emphasize the point that there are at least eight species of Owls found in this State, and this is the only one than can legally be killed or captured.

The Screech-Owl.—In one Screech-Owl was found a spider and an insect, and in others were found mice and English Sparrows. This bird, and in fact, all the other owls but the Great-horned, should always be protected.

The Long-eared Owl.—One specimen was examined, and in its stomach was found the remains of three short-tailed meadow mice or moles.

The Barred Owl.—In a Barred Owl was found the Star-nosed Mole (*Condylura cristata*).

Ruffed Grouse.—A Ruffed Grouse had eaten a great abundance of sumac seed, also the red berries and seeds of the karonia, bitter-sweet, and wild smilax. Another was filled with the more common food of catkins or flower buds of the birch tree and hazel bush.

The Downy Woodpecker.—A Downy Woodpecker was found to have eaten two grubs, similar to the flat-headed borer of trees.

A Night-Hawk.—A Night-Hawk, No. 7619, was found to have sustained its good reputation as an insect eater by regaling itself on the following material: a Carabid or ground beetle, three clover-leaf beetles, (*Phytonomis Punctatus*, four Pentatomids or stink-

bugs, several kinds of ants, a grasshopper and other insects, which could not be determined by examination, because fragmentary.

The Common Crow.—Much interest should be taken in the careful study of the food of the crow. Since it is unprotected by law at any time in this State, persons can kill specimens and send them to us. We have requested many times specimens of crows and jays, killed at different times of the year, and from different portions of the State. We should like to have them in order to enable us to make complete studies of their food and thus prepare and publish a Bulletin upon this special topic.

We have found the crow feeding upon snails, beetles, clover-leaf beetles, red-legged grasshoppers, and other grasshoppers, Pentatomids, or stink bugs, insect chrysalids, flesh, (probably taken as a scavenger around a slaughter house or where butchering was done), and pumpkin and corn seeds.

On the whole, those that were examined were fully as beneficial as injurious, if not more so.

The Blue Jay.—Blue Jays were found to have fed upon the remains of beetles, snails, chestnuts, berry seeds, leaf-eating caterpillars, and probably corn. This shows the possibility of good from the feeding habits of the Blue Jay; we also admit that it indicates the chance of injurious work at certain times of the year if they should become very numerous in grain fields. Perhaps the worst that can be said about the Blue Jay is concerning its destructiveness of birds' eggs and young birds; yet it must be admitted that it eats many insects and young snails.

The Logger-head Shrike.—This is a southern bird, remaining with us during the summer time, and nesting in thorn bushes or bushes with spines, where it finds it convenient to pin insects, small birds, frogs, mice and other creatures, which it stores for future use. The particular specimen which was sent to us, No. 8486, was found to have eaten a spider, grasshoppers and caterpillars. This shows that the Shrike is a bird worthy of protection, and in our opinion, should be preserved at all times, and is justly protected by law in this State.

The Chickadee.—(*Parus atricapillus*.)—The Chickadee is one of our smallest and at the same time, most valuable birds. It remains in some portions of this State, particularly the northern part, all the year, and is found in this (central and southern) part of the State all winter. It feeds to a great extent on the eggs of plant lice, and other insects, and upon small chrysalids. This specimen examined had eaten a moth pupa about the size of the pupa of the Codling Moth, which is destroyed by these little birds.

The Tufted Titmouse.—This is a near relative of the Chickadee, belonging to the same family, and partaking of similar food. Specimen No. 8336, was found to have eaten twenty eggs of a bug belonging to the bed bug family (yet one of the plant-infesting species), and also a few seeds.

In conclusion, let us urge a closer study of the habits of birds, with a view of detecting and protecting those which are beneficial and destroying none until they are known to be harmful. Let us especially endeavor to preserve the Woodpeckers and Nut-hatches, also Chickadees and Titmouse by putting up old posts or logs in which they can nest; and other birds, such as Blue Hen, Wrens and Mar-

tins, by preparing nesting boxes or other favorite sites for them. Let us remember that the stray cat is a greater enemy to the birds, and thus also to the agriculturist, than the stray dog, and thus kill the superfluous cat by drowning or otherwise, rather than turn them loose in some lonely spot to kill birds or starve.

Let us realize that the greatest work to-day before the Naturalist who is working for the husbandman, is to learn what are the enemies of the obnoxious insects, which infest plants, and to teach how to preserve, or propagate these and thus insure living checks to the hordes of devastating creatures.

The CHAIRMAN: What shall be done with this report?

It was moved and duly seconded, and agreed to that this report be received and placed on file.

MR. HERR: The Committee on Credentials has a supplementary report to make: We have examined the Credentials of W. H. Stout, and J. L. Patterson, and recommend that they be admitted to membership in the Society.

It was moved and seconded that the above-named gentlemen be received as members. Agreed to.

The CHAIRMAN: Dr. Conard, whose report comes next on the program, is not with us just at this moment, so we will take up the discussion of the report we have just heard. By the time we are through, Dr. Conard will no doubt be in the room. Has any one any questions to ask Prof. Surface?

MR. FENSTERMAKER: If we put out feed for the birds that are beneficial, will we not encourage the English Sparrow? Will not he get the food so placed?

PROF. SURFACE: The English Sparrow is a grain-eating bird, and not much of a flesh-eater. The Chickadee and Titmouse are rather meat-eating birds, and it would be wise to put out a little meat or tallow for their use. If seeds were taken out they would attract the sparrow, but the tallow is not much of a temptation for him.

MR. BLYHOLDER: I would like to ask Prof. Surface what he would recommend to exterminate the English Sparrow?

PROF. SURFACE: If I could recommend anything to do that, I would gladly do it; I am of the opinion, however, that he is one of the evils that must be endured because it can't be cured. I have heard, though, that the best thing that has yet been found, is to give them seed which has been poisoned by strychnine. The poison should be disguised by mixing it with sugar. It is an experiment, however, that I have not tried, but I will probably have a report to give you next year on this matter. I would say, though, that great care must be taken with regard to poultry, so that they do not get the seed. I do not believe the bounty law will ever be a success. It has been tried at various places, and a bounty of three, four, and even five cents, paid for every bird that was killed; but by killing

one-half or three-quarters of them, it simply leaves more room for the others to thrive. Consequently, it does very little good, and only for one year, as they will increase the next.

DR. FUNK: Can't they be baited and trapped?

PROF. SURFACE: They are a very shy bird. It has been tried to trap them, and they succeeded once or twice, but afterwards the birds would stay away from there for weeks or for months. I think that one of the things we can do is to modify our architecture somewhat, so that they will not have any place to nest. Try doing away with the overhanging cornice, so as to make their nests accessible, when they can be reached and destroyed with the eggs before they are hatched.

The CHAIRMAN: If there is nothing further on this subject, we will take up the question of poultry, by Dr. Conard.

Dr. Conard then read his report as follows:

REPORT OF THE COMMITTEE ON POULTRY.

BY DR. M. E. CONARD, *Chairman*.

Not being a practical Poultryman, I feel a little out of place on this Committee; but will promise you that my paper shall possess one commendable feature—brevity.

In times past, the growing of poultry and the production of eggs has been a branch of agriculture that has too generally been classed as of minor importance and thought too small to demand the attention of the chief executive of the farm. But are we sure that it did not return a better percentage of profit than some of the so-called more important branches or departments of the farming operations?

Let us see what we receive for feed consumed by a flock of hens, as compared with an equal value fed for milk, beef, or pork. Is it not a fair comparison to consider that the grain ration of a good working dairy cow will equal in value the ration of forty hens? Then, allowing the cow to give six quarts of milk per day, sold at three and one-half cents per quart net, she will return \$81.65 per year, while the forty hens receiving the same value of food and care produce one and one-half dozen eggs daily—sold at twenty cents per dozen—aggregating for the year \$109.50; and, again, allowing the same value for food and labor to produce one and one-half pounds of beef or pork daily, sold at eight cents per pound, we would receive only \$41.80.

Statistics tell us that Pennsylvania's Poultry Yards yield from 15 to 20 millions of dollars' worth of product annually, and that the United States produced \$600,000,000 worth of poultry and eggs

during the past year, and Mr. T. E. Orr tells us, in his Bulletin No. 143, that Pennsylvania consumes five times as much poultry and eggs as she produces annually. Now, is there another farm product of such vast importance to our every meal, the traffic in which has reached such vast proportions, and yet falls far short of meeting the daily demand.

It is very certain that we, as farmers, are face to face with a good market for one of the best paying products that the land produces, and how many of us know it? Is it not time we were looking around and doing some figuring for ourselves, and not going on in the old ruts just because our neighbors do? There is a possibility of our not doing enough thinking for ourselves and not working out each for himself the possibilities of his own personal ability, location and surroundings.

For many reasons it would not be possible for us all to be successful in the poultry business; but it is possible for many to succeed better, supplying the market allowing from 75 to 100 per cent. more for a given amount of food and labor than the market they have. One dozen of eggs is a small matter, so is one pound of soap, one loaf of bread, one quart of milk, or one box of matches, and lots of other things that enter into our daily needs, and how many of these numerous necessities are produced as a side issue without the care of a capable owner or manager?

Nevertheless, the unassuming hen has produced as much value in the United States in the past year as the wheat crop, and more than the cow, and more than the combined earnings of the railroads, more than the receipts of the steel industry, and still she has not supplied the demand.

With many mechanical devices and improved methods of to-day that make it possible to multiply the possibilities of the small operator many times over, and a good market at his elbow, it would be very easy to double the output of the Pennsylvania Poultry Yard, and make the hen not a competitor of, but a leader in earning power, of all live-stock kept on the farm.

The CHAIRMAN: What shall be done with this report, gentlemen?

Moved and seconded that it be received, and placed on file.

Agreed to.

The CHAIRMAN: Has any one anything to say on this subject? We might devote a few minutes to its discussion.

MR. CLARK: I had a set of Wyandottes that produced 150 eggs a year each, which I sold at two cents a piece, or a total of \$75.00. Now a hundred hens will cost about the same outlay of money as one cow, and will bring in about three hundred dollars. If you get a cow for the same amount of money, you would not have anything like the same amount of profit from her that you would from the hens.

A Member: How many hens did you have in the set?

MR. CLARK: Twenty-five.

A Member: You had them in a pen?

MR. CLARK: Yes, and I would keep my hens in sets of twenty-five to a pen; they are easier attended to.

The CHAIRMAN: If there is nothing further on the subject, we will go on with our program. Is Prof. Cochran of West Chester present?

It appeared that Prof. Cochran was still absent.

The CHAIRMAN: Since Prof. Cochran is not present, what is the will of the Convention in regard to passing on to to-morrow's program?

The SECRETARY: I think we had better take up the question of Agricultural Education; that belongs to this evening's program.

The CHAIRMAN: I beg pardon; I didn't notice that that is the next thing on the program. Our next subject then, is Agricultural Education, and the first speaker is Dr. Hays, of Washington. Is he in the room?

It appeared that Dr. Hays was not in the room.

The SECRETARY: I am sure that Dr. Hays expected to be here, and open this discussion, and I am entirely at a loss to know why he is not here this evening.

The CHAIRMAN: Since the gentleman does not happen to be in the room, we will call on the next speaker, Prof. Van Norman of State College.

Prof. Van Norman then spoke as follows:

AGRICULTURAL EDUCATION, PART 1.

BY PROF. H. E. VAN NORMAN, *State College, Pa.*

I am very sorry that Dr. Hays is not present. I was waiting to hear him, so that I might get my cue from him.

Education is being recognized as something more than can be learned in the district school, and we are coming to understand, too, more and more, that the college man is not the only one who may get an education; we can not all go to college, but we are realizing that a larger part of our educational work must deal with commercial men, such as you and me, and elder people who have gotten away from school. I propose, for the little time I occupy, to speak of some of the educational influences at work in our country, more particularly outside of our own State. The speaker who is to follow me may have something to say about these educational influences at work within, but I shall speak of those outside of Pennsylvania.

Most of you know that our agricultural colleges were established as a result of the land grant act of 1863. These colleges had not long been engaged in their work of trying to teach the principles of science which underlie successful farm practice, when it became apparent that there was not only need of a class of men who knew the science, its application to the art, and had ability to impart the knowledge to others, but there was need of much experimental investigation in order that many problems might be better understood. To meet this need Congress in 1887 passed the act that has given to every state in the Union an Experiment Station. In the beginning many of these stations were manned in part at least by men who had had no experience in the work they were to do. Is it any wonder that they found it difficult and that the farmer did not always approve of their work, impatient as he usually is for immediate "practical" results? Thanks to the farmers' institutes and other agencies the past few years has demonstrated that the Experiment Station has a useful place and the results of their work are becoming more and more apparent.

Not only are they showing us new truths, but they are helping to bring it to the attention of larger numbers of people, through the medium of cooperative or demonstration experiments conducted on the farms of private individuals in many parts of the several states.

In Canada they have several thousand men scattered throughout the country who are growing wheat, oats and crops of all kinds under the direction of the Central Experiment Station. The conclusions drawn from their work are published and distributed throughout the country.

Two results of this work are: first the good to the men who have done it under the direction of the Experiment Station. Second, any addition to the sum of our knowledge.

Most of us are not like the electric motor moving steadily on because of the constant pull of the unseen current, but we are rather like the gasoline engine with its noisy explosion every three or four revolutions of the wheel, increasing the speed which gradually lessens till the next charge is exploded; if the explosion fails to take place then the engine gradually comes to a stop. So with us, we need an explosion of some kind every now and then to keep us doing our best.

There is no reason why most of us might not be conducting some experiments on our farms that would add to our knowledge and increase the profits of our business, but we need the additional incentive of the "doing it for the Experiment Station" to induce us to keep the record of careful observations that are required to make the work most helpful.

In Illinois the Station hires the land needed in different localities and for a longer or shorter time conducts its experiments under the immediate supervision of its own trained men.

Indiana last year had some five hundred cooperative experiments in progress, nearly every county in the state having at least one or more.

They are of two classes: one in which a man from the Experiment Station goes to the outlying farm, selects a site to be planted, gives

directions for the work, and then when harvest time comes, he returns to help with the harvest, and note the results. This class of experiments are very helpful, because they are based on accurate observations. The next class is not so reliable, because they are carried out by men who the Station does not know, and it can not know how accurately the work may have been done. But in both instances they find the men on whose farms the work was done are very much interested, also the interest of the whole community is usually aroused. The neighboring farmers are apt to tell one another that "Bill Jones is carrying on one of those fool experiments from the college," and if he is successful, they become interested, and maybe next year three or four of them write and want to make experiments for themselves. This is a line of work that is growing very rapidly, and is particularly appreciated in the states where it has been taken up. I will not go further in this line, because there is too much ground to cover.

Illinois has led in getting its boys interested in the line of corn improvement. Then Indiana adopted the boy corn growers' movement. The statement was made in my hearing that in one county they had formerly produced an average of 33 bushels of corn to the acre. This year one hundred and forty boys, under eighteen years old, were each given an acre of ground in that county. These boys grew the corn under the general direction of a representative of the Experiment Station of that state. They selected the seed corn according to his directions, and planted it according to his directions, and what do you suppose was the average yield? Over 74 bushels of shelled corn to the acre, or about 140 bushels, according to the way you farmers count your corn. Yet the yield in that county before had averaged only 33 bushels to the acre!

Illinois is a great corn state, and they are interested in corn, as is shown by their experiments there, but our production is larger per acre than theirs. Illinois took up the question, and the boys took it up, and prizes were offered. The latest development is one that I want to lay special stress on. A representative of the Experiment Station told me he went to several bankers of the state. Why to the bankers? Because they are quick to see an opportunity to make an investment. He succeeded in getting them to offer a prize to the boys in the schools of the county who would make the best showing raising corn. What is the prize; five or ten dollars, which is forgotten almost as soon as received? No; it is a course in the State College of eight or ten weeks. There they meet other boys, and their interest is further aroused. Now, this action of the bankers succeeded in getting the farmers in some of the counties interested, and they say "we don't need the bankers to do that for our boys; we can do that ourselves," and they are offering their own prizes, and not only getting the boys interested, but are getting better farm work as a result.

The results of their work have been published and may be secured by those of you who wish to follow it up.

Let me refer now to a class of work in which I am especially interested: some of the extension work that is being done away from the college—away from the classic halls. At the late expo-

sition at St. Louis, Minnesota twice out of three times won the highest prize for the best tub of butter. It had the highest average of any state's exhibit of butter there, and you know how hard it is to get a high average on a large number of entries. How did they get that average? Minnesota keeps a dozen or more skilled butter-makers traveling among her creameries helping their operators to overcome the fault in their butter, and their exhibits at St. Louis with the long string of prizes showed the wisdom of this.

Canada has largely taken from the United States our foreign market for butter and cheese. That is for two reasons: We created a prejudice against our products by adulteration. Then Canada went out to supply the market. They have over thirty traveling instructors at work helping their factories make the kind of product the markets want. But the United States is waking up. Traveling instructors are at work in Illinois, Wisconsin, Minnesota, Michigan, Indiana, and to a slight extent in Ohio and New York; they are giving these instructions right where the men are who are doing the work.

Another thing is the special trains that have been run through the west, and later on in New England, where they stop at the different stations twenty minutes and have men on the train selected for the purpose, to give lectures. The train is well advertised ahead, and is on time so that the farmers who gather to see the demonstration and hear the lecture lose no time waiting. Many come, hear and are prompted to action who never go to the farmers institute. These trains do a lot of good work. The Pennsylvania Railroad, which most people think is not inclined to do anything for farmers, has made arrangements to run a special train of this kind over every mile of their road in the State of Indiana.

Then there is another educational feature—excursions to the college. Ontario was, I think, the first to develop the idea of farmers' excursions to the Experimental Stations. Their excursions bring in thousands of people in the course of a year. I have seen at the Michigan Agricultural College five thousand people on one occasion. Iowa runs excursions, and in two days last year 24,000 people visited the college and station. They look around the station, and they become interested in the experiments. You, who are here, are not so much in need of these things, but for every one of you who is here, there are ten, fifty, a hundred, or even hundreds, who do need them to arouse their interest and get them started on the way they should go.

Another influence for good, and I wish I had words to paint more clearly than is possible, the benefit of a great State Fair. I wish I could tell you of the great fair they hold each year in Chicago, and of the thousands of finely dressed, intelligent people who go there to see the magnificent display of fine animals on exhibition there—the cattle, and the horses that cost thousands of dollars a piece. The influence for good of an exhibition like this can not be measured. You go to these great shows, and look at these thorough-bred animals, and you say "these are all right for the rich man, but we farmer's can't expect to have them," and then you go out and see the carloads of steers that have been fed on the grain grown by this great grain-growing country of ours, and you see things that will

help you by sending you home with broader ideas. Then go in and see the students from fifteen or twenty of our Agricultural Colleges, with note-books in hand, judging the different specimens of cattle and horses, to develop their ability as judges. Then we come to the State Fair, where they are demonstrating butter making, and the Babcock test, hundreds of people stand there to listen and ask questions. And then we go out to look at the agricultural machinery, and see the number of people who come to these State Fairs to see the different makes of manure-spreaders, cement posts, silos, fences, and all the other modern implements for farm work. We must see these things for ourselves; we can't write all over the country to the different makers, and obtain any intelligent idea from their circulars, but we come to the State Fair, and listen to the salesmen, as they demonstrate the points of excellence of their particular make; we carry home a working idea. We know what we want when we are ready to buy. And I want to say right here that manufacturers are having to employ a better class of salesmen from year to year than formerly, because the farmers demand it. The growth of educational influences through our State Fairs has been very marked in the past few years.

These are some of the educational influences that are going on outside of our schools and colleges. Take this matter of our corn showing, for instance; there is not one of you who goes out and looks at the different kinds of corn that are shown there, but will profit by it even if you don't have anybody to point out to you the fact that very few of the ears have perfect butts or top. All of these things arouse your interest, and show you that there are very important educational influences at work around us, many of them in our own State. But another speaker will have more to say on that.

To sum up: Some of the educational influences at work in other states which we might consider with a view to adopting such as may be adapted to our conditions are:

Co-operative field experiments on many farms.

The boys' corn growing contests with a course at the Agricultural College as the prize for the successful contestant.

Traveling dairy instructors to help the butter makers and cheese makers, and to start cow testing associations.

Special dairy, corn, and good farming grains.

Excursions to the Agricultural College and Experiment Station.

The International Live Stock Show.

The National Dairy Show.

The State Fair.

The CHAIRMAN: I would again ask if Dr. Hays has entered the room since we have opened this discussion?

It appeared he had not come.

The CHAIRMAN: As Dr. Hays is not here, we will call on Mr. Bayard, of the "National Stockman and Farmer."

Thereupon Mr. Bayard read the following paper:

AGRICULTURAL EDUCATION, PART 2.

BY E. S. BAYARD, *Editor, National Stockman and Farmer, Pittsburg, Pa.*

It is a hard job for a man whose hair is burdened with hay seeds to tell you anything about this subject after such students of and experts in agricultural education have discussed it. What I shall say has especial bearing on the problem before us here in Pennsylvania, and I shall discuss only a part of that problem, for we have many branches of agricultural education—our Agricultural Department, our institutes, organizations, exhibits, papers, and our Experiment Station and College. None of these should or would interfere with each other were all developed to the limit of their possibilities.

It has been said that the chief need of agricultural education in this State is men and money. That statement, while broadly true, needs certain qualifications. A million of money and a hundred professors more mean little to our educational advancement if the people are not brought into contact with the educating influence. And this I believe to be the greatest problem before those who are studying agricultural education in Pennsylvania to-day.

It is a hard proposition, too, because the people can not be reached and interested without some outlay of money; and it is hard to get the money without having the people to back appropriation bills. We can not expect to do it all at once, but let us assume, as we have a right to assume, in view of what has been done, that the people are sufficiently interested to supply funds to begin the campaign. On what lines shall we proceed to secure the backing necessary for the development of agricultural education? Or in other words, how can we open avenues, and what avenues can we open, between the public and agricultural education that will lead to higher development of agriculture in this State? I propose to consider briefly a few things, some of them tried and tested, and others not.

APPEALS TO CONSUMERS.

In the first place, we must remember that in Pennsylvania a large proportion of the people are consumers, and they must be interested as consumers. They are not interested as producers and the arguments that appeal to producers are lost on them. Thus their influence is not secured by our present methods of seeking support for agricultural education and it never will be secured by such methods. They must be reached by arguments that touch them as consumers. I fully believe that a campaign carried on through the daily press would secure for our agricultural educational institutions the support of many consumers. Pennsylvania has the best and highest markets in the world, and nobody knows how high they are as well as the consumer does or how inferior the quality of the shipped-in produce. He should be told the ad-

vantages in cheaper and better living which will result from a higher agricultural development in Pennsylvania, and if he is once convinced of the correctness of this idea he will support agricultural appropriation bills. And he should be shown, of course, that the State's attention to other industrial education has not been wanting—that agriculture is seeking no favors not granted to other occupations now and heretofore. It seems to me that a literary bureau to attend to the education of the consumer on this and other subjects, notably, the selection, care and use of agricultural products, would be a great boon to him, and ultimately to the producer also.

But, of course, the efforts to bring the people and agricultural education together must be devoted principally to those who are or will be actively engaged in some branch of agriculture. It has been found in other states that if these people can be made to realize the benefits of agricultural education they will provide the means, and it may be so in Pennsylvania. I present a few suggestions which I think may assist the people to see and support measures necessary in this State:

CO-OPERATIVE EXPERIMENTS.

have been found in some states, and notably in Ontario, Canada, a powerful means of advancing agriculture and interesting the people in agricultural education. Ontario has had over a thousand men and boys engaged in experiments under the direction of the Agricultural College at one time. The benefits are beyond computation to the boys and a greatly increased attendance at the college. It seems to me that Pennsylvania agriculture especially needs such a system. No state has a greater variety of soils, conditions of altitude and climate, and even of races of men, than Pennsylvania has; and nowhere could co-operative work be more useful to the people or the agricultural college.

EXTENSION LECTURES.

We have at the Pennsylvania Experiment Station (and State College) probably the oldest plots in this country on which experiments have been conducted continuously. The results of these years of treatment of land with different rations of plant food are known but not utilized. The figures may appear in bulletins, but they are almost a sealed book to the farmers of Pennsylvania so far as their practical value is concerned. Their lessons have not been interpreted. And if they were interpreted they could not be placed before the people of Pennsylvania in such a way that they would be of the highest value without a staff of men whose duty should be to present these and other lessons. There is need in the educational staff of Pennsylvania for men who might be called extension lecturers, to place before the farmers of the State the lessons which are taught by these and other investigations. Modern photography and the ability to reproduce photographs before audiences afford ample means of bringing these truths vividly before the people who need them. The farmers' institute furnish the audiences. Let the Department of Agriculture supply the

people, as it does now, and let the value of agricultural education, and the results of agricultural investigation, be placed before them by the College and Experiment Station. The cost of this work should not be great. The interpretations and the results should be secured anyhow, and the photographs and the men to elucidate them should not be expensive. Such work is a link between the people and the agricultural educational institutions which must benefit both parties directly and indirectly. In the same line is demonstration work, especially of such processes as in dairying which can be completed in a short time and the results known. All these lecturers and demonstrators can be legitimately used to bring men under the influence of the educational institution either in their every-day work or by actual attendance upon it. Such a connection between the College of Agriculture and the public is one of the first and greatest necessities in this State.

EXHIBITIONS.

Some years ago I looked upon the exhibition of the Ohio Experiment Station at the Ohio State Fair. I had to look for it in those days, and so did everybody else. But so many people found it and asked so many questions of the men in charge each year that the Experiment Station resolved to make a bigger show next year. Interest in this exhibit has so increased that the Station has now so much space in Horticultural Hall that other exhibitors are beginning to accuse it of monopoly. The people of Ohio are now asking, and no doubt will receive, an appropriation for a building on their State Fair Grounds for the special purpose of allowing the Experiment Station to bring before them some of the results secured in their investigations. I do not advocate a State Fair in Pennsylvania simply because we have no State Fair; but right here is seen the great need of one. And it should be demanded by the people of Pennsylvania for this reason as well as for many others. This State can afford millions for adornment and not a *sou* for a State Fair, which would be a profitable investment financially as well as otherwise. Let me read you a few extracts from letters which have been received in the past few days, and then you can see how thousands of farmers are reached in other states. We should be reaching them in the same way:

"C. D. Smith, Director.

"Michigan Experiment Station,
"Agricultural College, Mich.,
"Jan. 12, 1907.

"E. S. Bayard:

"Dear Sir: Our station exhibit has been carried forward at the state fair for many years. During the season of 1906 we made a special effort, through a special appropriation from the state. Outside of this special appropriation, the Experiment Station on its own initiative, made an exhibit at Detroit at the main state fair and at Grand Rapids at the West Michigan Fair. This exhibit consisted of about half an acre of ground planted to the cereals of economic importance or of supposed economic importance. For instance, any of the cereals that were unusual, or with which the farmers were not familiar, were planted there, like the pennisetums or the kaffir corn or some of the newer millets. So in the legumes we had rows of soy beans, of different types of cowpeas, Blac Murarau, and so down the whole line of legumes we tried to have representatives at the fair. * * * * I am here to report that the exhibit attracted a great deal of favorable comment and attention. It will be repeated on a larger scale next year.

"We made an exhibit of live stock not only at the State Fair, but at the West Michigan Fair and half a dozen other fairs, which were perhaps the largest in point of attendance of the county fairs. This was done under a special State appropriation for the purpose. We had pens of swine, illustrating the influence of different rations. We had cattle, not only fat cattle, but dairy cattle, dairy cattle with records, scrub cows, pure bred cows, and fattened animals. Naturally we had large placards over these animals giving the records and showing why they were exhibited. A scrub cow would have no place at a fair except to illustrate the advantages of the pure bred animal and this we did by means of charts, and the same way with sheep. Thousands of visitors viewed these pens and plots. We had men stationed about both places to answer questions, and possibly no more instructive feature was possible, at least none was presented at any fair which competed with our exhibit in value of the on-lookers.

"A third feature of our exhibit was made by the station and college jointly and consisted of pressed plants, yarn frames, model of a horse to illustrate the line of draft, corn to illustrate the different types, a large exhibit from the Women's Department, showing how sewing is taught and giving some specimens of the skill in needlework, views of the college, literature of the college, a very large fruit exhibit from the Experiment Station, three or four hundred plates of apples, grapes, peaches, with illustrations of spraying materials and methods of making spraying materials, exhibition of nozzles and methods of spraying, samples of the insect and fungous enemies of fruit plantations. This, in brief, is about the scope of our exhibit. I am very glad with you that the people of our State are much interested in the Experiment Station as is manifested by the fact that we have forty-three thousand names on our mailing list and that our list of students is gradually growing longer.

"Yours truly,

"(Signed) C. D. SMITH."

"Chas. E. Thorne, Director.

"Ohio Agricultural Experiment Station,

"Wooster, Ohio,

"Jan. 14, 1907.

"Mr. E. S. Bayard:

"Dear Sir: Replying to yours of the 10th inst., I would say that the exhibit of this Station at the Ohio State Fair has been a matter of evolution. When I took charge of the farm of the State University, in 1877, I began at once making small exhibits at the State Fair, the first exhibits being limited to samples of different varieties of wheat which were being grown on the University Farm. When the Experiment Station was established in 1882, it took up this work. I think that the college farm relinquished it at once entirely, or nearly so, to the Experiment Station at that time; then when the entire farm was turned over to the control of the Station the exhibits, of course, went with it. I believe they have been kept up continuously, with little or no intermission, since the period I have mentioned, and have grown from a little show, occupying 6 or 8 linear feet of space in one of the buildings of the fair to the one of last year, which extended around two sides of their great horticultural building occupying a total of 160 linear feet. I could only give the crudest estimate of the number of visitors which seek information at this exhibit, but during busy days of the fair for many years past there has been a constant stream of visitors passing for six or eight hours each day, many of whom stop to ask for information. In our first exhibits one or two men at most were amply sufficient to take care of the whole exhibit, but for the last two years almost the entire scientific staff of the Station has been present, with their assistants, and each man has been taxed to the limit of his physical strength to keep up the work.

"At the urgent solicitation of numerous county agricultural societies we have sent this exhibit to as many such as could be accommodated during the fair season. Last fall we chartered a freight car for this purpose, moving it from one fair to another during the season. I already have on file several applications for next season's exhibit.

"Yours truly,

"CHARLES E. THORNE.
Director."

"College of Agriculture and Agricultural Experiment Station,
"E. Davenport, Dean and Director.

"University of Illinois,

"Urbana, Ill., Jan. 16, 1907.

"Mr. E. S. Bayard:

"Dear Sir: In answer to your questions will say (1) the Illinois experiment station exhibited at the Illinois State Fair in 1899 for the first time; (2) the amount of space given to the station by the State Board of Agriculture is 40 feet square. We have had this space from the first time that we exhibited with-

out any change whatever. We did not, however, in our first exhibits fill all this space but allowed some other person, usually a representative of some farm paper, to occupy a portion of our allotted space. The past two or three years, however, we have filled our space entirely, and have wished for more. It is almost impossible for us to give an estimate of the number of visitors that seek information at the exhibit of the station. Some days there will be many more than on other days, and at some hours of the day they will be much more numerous than at others. It has been the privilege of the writer to have charge of the exhibit at the State Fair for a number of years, and during that time I have known the space to be practically crowded with people seeking information and examining the exhibits, so much so that we have had hundreds in two or three hours. Usually we find the largest numbers seeking information will come from 10 to 12 in the morning, and from 1.30 to 4 in the afternoon. Aside from these hours it is seldom that we have any visitors seeking information unless it has been some one who had been there before, and failed to secure the information he desired. It is not always the men that go to the exhibit for information, but many ladies as well * * *

"Our State Fair exhibit is becoming more popular, and is attracting greater attention each year, inasmuch as we are attempting to show the results of our soil and crop work in detail there. We have the experiment farm located here at Urbana, represented in miniature, with the crops growing on the different plots even as they would be seen here at the station. Together with this we have a statement for a number of years back, giving the yields, crops grown, effect of fertilizers, if any, etc. We have also in other portions of state, other than here at Urbana, crop production fields, one at Fairfield, Wayne county, one at DeKalb, DeKalb county, and one at Sibley, Ford county. This coming fall will complete three years' work on the field at Fairfield, Wayne county. Therefore we shall include in our exhibit a miniature reproduction of the Fairfield field with the crops growing upon the different plots even as they would be seen there. This will crowd to some extent our space, but we feel confident that the interest shown and the information given in this way is of sufficient value to warrant the crowding of our exhibit quite materially.

"Trusting that this will be satisfactory to you, and will be of service to you, I am,

"Very truly yours

"(Signed) O. D. CENTER."

"University of Wisconsin,
 "Agricultural Experiment Station,
 "Madison, Wis., January 17, 1907.

"Mr. E. S. Bayard:

"My Dear Sir: Yours of recent date to hand, and I note what you say regarding the exhibit at the State Fair. The Wisconsin Agricultural Experiment Association made this exhibit for the first time this year. We used a booth about thirty feet in width and about twenty in depth. * * *

"At the International Live Stock Exposition we made an exhibit from the College of Agriculture, using about sixty feet of wall space. We also showed a part of the Wisconsin Experiment Association Exhibit at this exhibit.

"At both places there were so many thousand people visiting our exhibit and listened to talks concerning various phases of the exhibit that it would be very hard for me to make any estimate of the number. Our exhibits at both places were well received by the directors and by the people in general.

"I feel that the Wisconsin Experiment Association is doing a great good for the farmers of Wisconsin. The organization was effected in 1901 and has now a membership of practically (paid-up) one thousand. The membership is scattered so widely over our state that they place before many farmers in Wisconsin demonstrations that can be done with pure-bred seed grains and forage plants. * * *

"Sincerely yours,

"R. A. MOORE."

LOCAL EXHIBITIONS.

If Pennsylvania has not a State Fair, it has many local fairs. Why could not exhibits and lecturers or expounders be utilized at these fairs? A few more exhibits must be provided for, and a few more men used; but by properly arranged circuits a few exhibits could be made to cover in a few years the entire State at comparatively small expense. But it takes two parties to make satis

factory arrangements of this kind. The State has no right to say to these local fairs that its exhibits shall be given room, or that a part of the expense shall be borne. I have therefore written to several of the local fairs in various parts of the State to secure a few expressions from them. Here are a few of them:

"The Great 1907 Pulaski Fair.
"Pulaski, Pa., January 14, 1907.

"Mr. E. S. Bayard, Sec'y, Pittsburg, Pa.:

"Dear Sir: Replying to yours of the 10th inst., will say that in my opinion the Experiment Station Exhibit you mention would be of a very great use in the locality, not only as an educator, but as an exhibit of interest to all the farmers of this community, and would most certainly draw as an attraction, and to say our Association would be willing to give space, I can assure you of that being done in Agricultural Hall, and I feel certain that we would defray traveling expenses and hotel accommodations to the manager, if not exorbitant, which I know they would not be. I will confer with the board in a day or two, and will write you more fully as to this last matter.

"Very truly yours,
"JAMES S. WOOD,
"Sec'y."

"Union Agricultural Association,
"Burgettstown, Pa., Jan. 12, 1907.

"E. S. Bayard, Sec'y, Pittsburg, Pa.:

"My Dear Sir: Replying to your communication, coming from you as Sec'y of the 'Penn'a Live Stock Breeders' Association,' in regard to an Experiment Station exhibit at county fairs, I think such an exhibition would be an attraction to our fair worth very much more to our people than the probable cost. I think our Association would be ready to meet all the requirements as to cost and room.

"Our board will meet in February, date not fixed yet. I will bring the matter to the attention of the board at this meeting and will be able to write you more definitely.

"Very respectfully yours,
"R. P. STEVENSON, Sec'y."

COLLEGIATE EDUCATION.

No doubt it has dawned on you all before this that I have confined my suggestions to plans which largely involve our agricultural educational institutions at State College. This is for a reason, and that reason a dual one. First, our other educational institutions are largely provided for by existing laws; and second we must build our permanent structure on the foundation of education of the young. The farmer of the present must be reached in any way and at any time that we can reach him. But the farmer of the future must be sent to school for a longer or a shorter term. I am aware that Pennsylvania's Agricultural School has not had what it should have had, and has not been what it should have been. But a better day is coming. It is preparing to carry out its primary purpose, agricultural education. It is seeking men, and has found some, but money must come to support them. We must give it to them out of our State Treasury if Pennsylvania is to get into line with other states. In the past we have heard charges of fossilization, of lack of usefulness, brought against this institution. This must not be so in the future, and will not be possible except to the jaundiced mind. All such things, along with the attempt to control things by any political clique, should be swept into the

scrap heap of the past. We want no antagonisms in our college or over it.

Our only antagonists should be ignorance and prejudice—the two foes of agricultural education in all times and places. Responsible heads are being secured, and let us hold them responsible. If we give proper support to our agricultural educational institutions, there will be no excuse for any farmer not being helped by them. If we give our institutions a start, the things which I have named, or something as good, will come to pass, to the immediate and permanent betterment of things agricultural in this State. Impress the men who vote money for agricultural education with the necessity for such a start, and the people will see that they keep it a-going. I have faith in our people. If they do not wake up this year, they will sometime, because they must. But your support is needed NOW for a State Fair and for an agricultural school. The agricultural press, that noble army of men who march under the glorious banner whereon is inscribed the stirring words “Now is the time to subscribe,” is backing this cause. The farmers’ organizations are backing it. And if individual farmers will back it we shall have more progress to record in the next five years than in all the previous years of our history.

The CHAIRMAN: Since Dr. Hays does not appear to have come, we shall be pleased to hear from any one in the room on this subject, for a short time.

MR. WELD: I notice that there is with us this evening one who is interested along the line that has been talked of, and I have no doubt but that every one here will be glad to hear from him. I refer to Dr. Welch of the State College.

The CHAIRMAN: We shall be very glad to hear from Dr. Welch.

Dr. Welch then spoke as follows:

ADDRESS OF DR. WELCH.

Gentlemen: I have been very much pleased with what I have heard here tonight, up to this point; I was especially pleased to hear the Press make itself heard in behalf of education, particularly Agricultural Education, because I have been interested in it for a good many years. For the past few months I have been especially interested, because I have been placed in a position where I am expected to look after the financial condition of the Pennsylvania State College, and, following what has just been said, I presume it would not be out of place for me to tell you some of the things that I have found.

A few months ago I didn't know any more about the financial condition of the college, or the way the State of Pennsylvania had been taking care of the college, than any one else here, but when I went there and began to get at the bottom of things, I learned some things that surprised me, and will, I presume, surprise you.

In the first place, I heard before I went there that the Pennsylvania State College has been sailing under the banner of Agri-

culture, while spending the money for many other things. I want to say that when I came to look into the matter, I found that every dollar that has ever been appropriated toward it in the State of Pennsylvania, has gone for exactly the purpose for which it was appropriated, and that if anybody was to blame, it was the fellows who did the appropriating. Every dollar has gone to its place.

When I first went there, I heard the same complaints in regard to results under previous administrations, and this is what I found. I want to say that it was a matter of some surprise to me that any results could be secured under some of the administrations, because of the meager support that was given them.

You will be surprised to learn that in looking over the condition of the college, I found that it is \$15,000 behind in its coal bill. They had either to say to the boys "you go home; we have no more money to keep you warm," or to borrow money to keep them warm. The bill that was presented to the House a few weeks ago contained this item of \$15,000, and I think it is clear to the world that there must be heat and light for the boys, and that they must be paid for. I have been comparing the support in this State towards the Department of Agriculture, with other states. There are men here who can give these items better than I can, but when we compare the appropriations in Pennsylvania with those in Iowa and Ohio, it should make everybody in Pennsylvania who has anything to do with appropriations ashamed. That we have not been doing great things, is due more to the fact that while the rest of the world has been moving on, we have been standing still in Pennsylvania. We have not been supporting Agriculture. It is true that large sums of money have been appropriated by the State to the college for other purposes, but the reason for this is that there has been a great pressure on the part of these boys to go into these other departments. For instance, they have a school there called the School of Engineering, which includes Electrical, Mechanical and Civil Engineering. It is calculated for four hundred students, and there are six hundred in it now, and more want to come in. The appropriation there has been entirely too meager to take care of what has been done, and is doing there now.

The other day, just to see how many of these boys represented the soil of Pennsylvania, I looked for the number of boys in the Department of Agriculture, and found them about one hundred and fifty to one hundred and seventy-five as against nine hundred in the other departments. Now, under the laws of the United States Government, and the laws of Pennsylvania, the Pennsylvania State College was established for the purpose of encouraging Agriculture and the Mechanic Arts, and for extending the liberal education along other lines that are now being emphasized by the United States Government. It is right that the State of Pennsylvania should give to the young men the all-round education provided for under the law, and I am here tonight on your invitation, and I want to plead for all the departments of the Pennsylvania State College, all and every one of them: The Department of Agriculture, the Department of Mathematics, the Department of Literature, of Engineering, the School of Political Economy, all have in view one common good, and these departments are knit together, one

depending on the other for evolution. The entire school should have the support of this great State of Pennsylvania, that has an annual income of over \$20,000,000 to dispose of. So I say that I feel that the time has come for every department of that great institution to be properly supported, and I have been asked by the Board of Trustees to give them such data as will enable them to submit a bill for support to the coming Legislature that will put every department strongly on its feet. Tomorrow there will be a meeting of that Board of Trustees, and when that bill comes up it will contain exactly what is needed to put every department of this college squarely on its feet, and then I think if there are any criticisms coming, they will be due to those who do the appropriating, and not to those who are managing the institution. I believe that the people of Pennsylvania want this college to be taken care of, not simply in Agriculture, but I think they want to take a long stride in Agriculture for having stood still so long, although we don't want to spend more on that than on any other part of the college.

I don't know, Mr. Chairman, that I can say anything more, but I thank you for the opportunity of saying these few words.

The CHAIRMAN: Has any one anything further to say on this subject. It is drawing pretty near time to adjourn, but we shall be glad to hear a little more if any one has anything to say.

COL. DEMMING: Before we adjourn, the Mineralogist of the Board respectfully asks the Chairman to submit his report tomorrow evening, instead of tomorrow morning, for the reason that he is required to be in another county in court, not as a criminal, but as an expert witness.

The SECRETARY: Would you be prepared to make it this evening?

COL. DEMMING: No, sir.

The CHAIRMAN: Would you be prepared to make it late tomorrow afternoon?

COL. DEMMING: I will try to, but I am not sure.

The CHAIRMAN: We will simply have to wait until you can come.

PROF. VAN NORMAN: Mr. Chairman, I want to make the announcement that our milking machine is here, and our man who is to operate it, will be prepared to do so at nine o'clock tomorrow morning, at four o'clock tomorrow afternoon, and at ten o'clock tomorrow evening, and at the same hours the next day. The butter is in the cold storage house, and will be exhibited Thursday. We have no good place to keep it in, so have made these arrangements. The milk that is sent in will be examined by the dairy experts from Washington, and report made to you on same.

The SECRETARY: Before adjournment, I wish to announce that we still have some cards here, showing the location of the different hotels, with their rates, for the benefit of those who may require them.

The CHAIRMAN: We have reached the end of our program and the hour is growing late. A motion to adjourn will be in order.

On motion, the meeting was adjourned until 9 a. m. Wednesday morning.

Harrisburg, Pa., Wednesday Morning, 9 o'clock,

January 23, 1907.

The meeting came to order with Vice-President P. S. Fenstermaker in the chair.

The CHAIRMAN: The first number on the program is the report of Dr. William Frear, State Chemist; is he here?

It appeared that Dr. Frear was not present at the time.

The CHAIRMAN: The report of the Mineralogist has been postponed, so we will take the next one. Is Prof. Surface ready to make his report?

Prof. Surface was reported as not being in the room at that time.

The CHAIRMAN: We will proceed to the Report of the Committee on Fertilizer, if Mr. McGowan, the Chairman, is here.

Mr. McGowan then read his report, which is as follows:

REPORT OF COMMITTEE ON FERTILIZER.

BY HON. HOWARD G. MCGOWAN, *Chairman*.

The term is broad in its meaning, which would commonly include all substances that tend to increase the fertility of our land. No subject is of greater importance to our agricultural people than is that of Fertilizer. The fertility of a man's farm is the mainspring to his business. It is his bank account. It is his reserve fund, from which he can draw upon, to supply that which enables the farmer to conduct his business remuneratively. Therefore, every farmer should look more carefully after the fertility of his land.

Many homes would be happier, farms richer, and the spirit of contentment would pervade, where very frequently we find from the want of proper fertilization, the farm becomes poor, unyielding in crops, much to the discouragement of the farmer, and discontent of his family. Even the boys and girls will not so soon become restless when the farm is rich and abundant in crop production.

The proper care of the farm manure, which is our main fertilizer, is first to be considered by every farmer. This caution has been so frequently referred to, and impressed upon the minds of our farmers by the agricultural papers and Farmers' Institute lecturers, that it needs only a word of continued vigilance from our committee. We know of very many instances, however, where farm manure as a fertilizer is very much disregarded. In some parts of our country it is even dumped into ravines. In Missouri, not

in Pennsylvania, it is dumped by the roadside, while in Oregon it is given away for the asking. In these instances they need the teaching of Farmers' Institutes. We feel that the term "fertilizer" largely applies to commercial fertilizers in our connection, and to this end we will dwell for a few moments and suggest a few things.

We would recommend the Commercial Fertilizer be not depended upon entirely for the fertility of our land, but, be used as a valuable aid to assist in crop production, after the most judicious care has been taken of all other sources of fertility.

Commercial Fertilizers are costly, make high bills for the farmer, and in Pennsylvania thousands of dollars are uselessly spent by our farmers. The use of Commercial Fertilizer in Pennsylvania from all sources where we have had any opportunity of obtaining information, has, during the last year, far excelled that of any former year in our history. Farmers are becoming more and more expert (some are not, however), in buying fertilizers intelligently by adhering more closely to the analysis which is printed on the sack, as is now provided by law. Three elements control the value of any fertilizer and they are too well known to speak of at any length, viz: Nitrogen or Ammonia, Phosphoric Acid, and Potash.

By using a little arithmetic any one can in a short time calculate the value of any brand of Commercial Fertilizer on the market today. Vast sums of money are uselessly spent annually by the farmers of our State by not taking the proper pains in making calculations before purchasing. They simply buy a fertilizer by its name and not by what it is worth on the market. This haphazard way of buying fertilizer, (not by all) is like buying a suit of clothes for so much cash, and not taking into account its real value. A ten dollar suit is worth about that amount, and we know it.

When we have asked some farmers in our experience what kind of a fertilizer they use on their farms, in many instances they would say about \$18.00 goods or \$20.00 goods, as the case may be. This really does not indicate anything at all. If, on the other hand, you would ask him what kind of a fertilizer he uses and he tells you 1, 8, 4, or 2, 8, 10, or 10, 5, as the case may be, you can just put it down that he knows just what he is doing, so far as the law is at present.

We would recommend for consideration by this Board of Agriculture, if it would not be advisable to press upon the present Legislature, to pass a law in reference to placing upon the outside of each sack of fertilizer, not only the analysis as it now is but state from what source the different ingredients are derived. While, as I said before, we may buy intelligently as far as we can, but would not the farmer be fairer dealt with if he would know from what source he was obtaining the different elements in the composition of the fertilizer?

The Department of Agriculture has been aiding the farmer, very greatly, by having samples of fertilizers collected all over the State and subsequently having them analyzed at the State College by the State Chemist. This work is done (and is generally known) for the purpose of ascertaining whether the contents of the sack, is just what is printed on the outside of it. Sometimes farmers

ask the question: "What is the consequence if the analysis on the bag does not conform, or come up, to the statement on the bag? Is the manufacturer informed of it, and forced to make good to the users of such fertilizers?" In reply, please let me say that from direct knowledge, our present Secretary, Hon. N. B. Critchfield, has been doing all within his power to bring parties to an account whose goods upon the market were found deficient in value according to printed or guaranteed analysis. In one instance, to my knowledge, the Secretary brought suit against a certain manufacturer and personally saw to it that said manufacturer made proper restitution or refunded the amount of loss that parties suffered by the analysis being deficient. True, a fine is collected also, as a punishment. But, as the present act makes it a fine of only \$25.00, we, the Committee on Fertilizer, think, and would suggest, that this fine should at least be \$200.00 instead of \$25.00.

We also beg to suggest, as the Committee on Fertilizer, that it would be wise and expedient in order that the law might be more closely guarded, to establish a "Bureau of Fertilizer and Feed Control." Under this head prompt prosecutions could be brought, and in all cases where any shortage occurs, it would be the duty of this Bureau to prosecute, and thus leave no manufacturer go unpunished, whose goods did not meet the requirements of the act. This Bureau would be under the supervision of the Secretary of Agriculture.

The CHAIRMAN: Gentlemen, what is your pleasure in regard to this paper?

Moved and duly seconded and agreed to that it be received and placed on file.

The CHAIRMAN: We might devote a few minutes to the discussion of this paper if any one has anything to say.

A Member: With your permission, Mr. Chairman, I would like to ask whether there is not on the statute books of our State, a law that if the fertilizer does not come up to the standard stamped on it, the manufacturer is at fault, and is liable to prosecution?

The SECRETARY: No; there is no statute, but my impression is that there is a common law that if the consumer or purchaser does not get the value of the goods, the manufacturer is expected to make good the amount, but there is nothing in our fertilizer law as it now stands. The law, as it now stands, simply states that there shall be placed on the sack the name of the manufacturer, the place where it is made, the percentage of Phosphoric acid, soluble and insoluble, and Potash. The law provides that any person who places upon the market goods that are not so marked or goods that contain a larger percentage of these fertilizing ingredients, is guilty of misdemeanor and can be fined not less than \$25.00 nor more than \$100.00.

A Member: I don't think that there is a subject that can come up at this meeting in which the farmers are more deeply interested than in this subject of fertilizers. There is nothing that we purchase on the farm for which we spend more money than we do on

fertilizers, and when I buy fertilizer I want to know from what sources the ingredients are secured. I think there should be a law compelling them to publish that. I have a little farm of twenty-seven acres in Chester County, and that farm is my chemist, and it is better than any Professor. I have a friend within a few miles, who has a little farm, and he has the potash right on the road. You can see it there, as you walk or drive by. He does not need any potash, but on my farm I need it. I want all the potash I can get, but I find that what will produce a crop on one acre will not do so on another. And I have no doubt that many farmers spend thousands of dollars in applying fertilizer without knowing just what is the best for that soil. Now, I went through this, and at considerable expense, so I know there is no subject in which the farmers are more deeply interested than in fertilizers.

THE SECRETARY: There is a bill before the House now, requiring manufacturers of fertilizers to show not only the amount of nitrogen and phosphoric acid, but where it was secured. Then if the farmer wants something that will act quickly he can get his nitrogen and soda, and if he wants something that will act a little more slowly he can get his dry blood, and if something that acts more slowly still, he can get his raw bone. The bill says that when these things are stamped on the bag, the manufacturer shall stop right there, and not go on and give any further information, because it would be misleading.

MR. SCHWARZ: I am very glad to see that the farmers are taking interest in this. Twelve years ago, when I was in the Legislature, a bill was passed, largely through my efforts on this subject, and I am glad to see that the farmers are progressing along this line.

MR. BECK: I am glad to say that when the bill Mr. Critchfield refers to was up before the Legislative Committee yesterday, there was no opposition to it, and it is likely to pass.

THE SECRETARY: I am glad to know that it is moving along so nicely.

THE CHAIRMAN: I see Dr. Frear is here now, and we will take up his report—the report of the Chemist.

The report reads as follows:

EXPERIMENTS WITH LIME AND CRUSHED LIMESTONE ON A PENNSYLVANIA CLAY LOAM SOIL.

BY DR. WM. FREAR, *Chemist, State College, Pa.*

Owing to the live interest exhibited today in the relative merits of lime and crushed limestone (carbonate of lime) as means of increasing the productiveness of soils—an interest shown by numerous inquiries received by the writer and by the frequency with which the subject is discussed in the agricultural press—it has been thought that a summary of the results obtained in experi-

ments upon the subject at the Pennsylvania Experiment Station might well be presented at this time.

Permit me at the outstart to present a brief statement of the present practice in Pennsylvania and to note some of the claims made by advocates of the two agents to be compared.

Pennsylvania is richly supplied with limestone, in strata readily accessible in the eastern counties, less easily reached in the western and northwestern counties and entirely lacking in the exposed strata of the northern and the extreme western parts of the Commonwealth. The use of lime, as shown by a careful inquiry made several years ago, is extensively practiced by the majority of Pennsylvania farmers, especially by those whose lands are clays or heavy loams. Even in communities where, for a time, the introduction of commercial fertilizers led to the abandonment of liming, the occasional use of lime has again come into vogue as a valuable means of controlling the conditions of crop production. The use of carbonate of lime, except as it has been applied in the form of wood ashes to the orchards and gardens on the stony hillsides of our northern counties, has on the other hand, been very limited.

The general consensus of opinion, based upon the extensive local experience in the practice of liming, is, that lime is an excellent agent for the maintenance of good tilth on heavy lands; that, when properly used, it greatly increases the crops produced, and leads to no observable deterioration of lands of strong character; and that it is a specific for the treatment of our soils. There are many communities, however, where the old saying, 'Lime enriches the father, but impoverishes the son,' is frequently heard, especially with reference to farms on which care has not been taken to maintain the humus and nitrogen supplies by careful husbanding of the straw and manure, and by the skillful use of green manuring. The need for the exercise of caution in liming light lands, lest they become ever alkaline or be injured in texture, is quite generally recognized.

The advocates of the use of crushed limestone and other carbonates of lime, in place of lime (caustic or slacked lime), claim that the carbonate performs practically all of the functions of lime in the soil and should be preferred because it is the compound in which nature furnishes this valuable alkaline earth. Lime is said, by them, to work too rapidly and therefore wastefully, especially in the destruction of humus and the conversion of the insoluble stores of nitrogen into soluble forms that, because present in excess, produce stem and leaf out of proportion to grain, and that leach away in drainage waters before the crops can utilize them. Lime is further said on the basis of many laboratory observations, to retard the development of certain valuable soil bacteria, especially those that gradually convert the slightly available humus nitrogen into highly available nitrates; whereas, carbonate of lime is declared to be always helpful, rather than prejudicial to the best development of these little friends of the tiller of the soil.

The results to be considered shed some light upon a number of points in the controversy. The field experiments included from a part of the general fertilizer experiments begun at State College in 1880 and still in progress—the longest continued series of fertilizer experiments in America.

The soil is a rather heavy clay loam overlying and formed from the Silurian-Cambrian limestone strata of Nittany Valley, a soil probably to be classed with the so-called "Hagerstown loam," which forms a part of the limestone lands of northern Lancaster county and of Cumberland Valley. The writer has not had opportunity to analyze completely the rocks underlying the soil in question, but analyses of samples taken from corresponding strata nearby show very small amounts of clay and iron, and even very little carbonate of magnesia.

The soil used for the experiment plots was not analyzed at the beginning of the experiments. It is probably represented fairly, however, by samples taken from a neighboring field showing similar characters. The soil sampled had never been limed nor intensively treated with commercial fertilizers. Despite its limestone origin, this soil contains only 0.26 per cent. of lime and 0.35 per cent. of magnesia, with merely 0.39 per cent. of carbonic acid—an amount sufficient to form carbonate with barely one-fifth of the lime, which, with the magnesia, must therefore be present in other states of combination. Crop experience on these lands shows little need for potash fertilizers, for most crops and analyses show as much as .34 per cent. of potash, .039 per cent. quite available. Experience shows, however, a pronounced advantage from the use of phosphates, whether acidulated or non-acidulated, despite the presence of .124 per cent. of phosphoric acid (P_2O_5), an amount fully equal to the average in the Eastern States. Of this fully one-tenth appears to be available, judging by the action of mild solvents. The soil was found to contain a fair amount, 2.2 per cent., of active humus, and a moderate quantity of nitrogen, .116 per cent. Of the latter, constituent, about one-fortieth was present in the form of ammonium salts and over one-tenth in the form of nitrates—the samples having been taken in late summer when the land was in corn, conditions favoring a large accumulation of nitrates.

Laboratory experiments were made by mixing lime at the rate of 150 bushels per acre with the soil, keeping it moist for three months and then allowing it to dry gradually. At the close of a year the availability of the potash and phosphoric acid had been distinctly increased, the active humus had been reduced nearly one-third, and the proportion of nitrogen had somewhat diminished. The quantity of ammonia was much reduced, and, despite the alkalinity of the soil, the absolute quantity and the proportion of nitrate nitrogen had as clearly increased. Of the large quantity of lime applied, less than one-half had been converted to carbonate, a fact contradicting the opinion of those who hold that caustic lime is sure to be promptly carbonated in the soil. It should be remembered that the soils bore no crops during the time of the laboratory experiments.

In the general fertilizer experiments conducted under the ordinary four-course rotation of corn, oats, wheat and hay (mixed clover and timothy), four plots have received dressings of 4,000 pounds of stone lime slaked after weighing and applied upon the land after plowing for corn. Four others have received similar applications to the wheat and the corn of 4,000 pounds of crushed limestone, harrowed into the plowed ground. In 1859 the whole farm was heavily

limed and has until recently shown little need for the use of this material. Great gains from liming should from this fact, not have been expected. It is at once apparent that the frequent liming at the rate of 50 bushels of stone lime per acre during the long period of these experiments, is an extreme test of the effects of the method.

The actual quantities of lime applied in the two forms during a rotation are not far different. The cost of the lime was 5 cents per bushel, equivalent to \$2.50 per acre, while the cost of the fine crushed limestone was \$6.50 per ton on the average, equivalent to \$26 per acre during a rotation. This cost may be greatly reduced by purchasing the crushed stone in large quantities, but will remain much greater than the cost of the fine powder obtained by slaking burnt lime.

The quantities of the several crops obtained on the two lots of four plots each, receiving the several treatments, during twenty years, or five complete rotations, the yield of the adjacent unfertilized plots being taken as 100, were:

Combined Yields for Five Rotations.

	Lime.	Crushed lime- stone.
Corn:		
Ears,	84.3	92.0
Entire crop,	86.7	94.0
Oats:		
Grain,	88.1	102.8
Entire crop,	108.3	119.0
Wheat:		
Grain,	106.8	110.4
Entire crop,	107.0	112.0
Hay,	91.8	103.6

That is to say, in each case the yields with the carbonate of lime showed superiority under the conditions of this experiment over those following an equivalent application of caustic lime. After each of these treatments, however, the corn yield was depressed. The yield of threshed oats was depressed by the lime and little affected by the carbonate; but both increased the total crop, the carbonate most. Both treatments were followed by an increased yield of wheat—grain and straw—a slight advantage again appearing on the side of the carbonate. Lime greatly depressed the following hay crop, however, while carbonate slightly increased it.

The total application of lime in five rotations was very large, amounting to 10 tons per acre, equivalent to 0.5 per cent. of this soil taken to the depth of 8 inches. So that, if the lime were not largely removed by descent to subsoil or by solution in drain waters, nearly 1 per cent. of carbonate of lime could be formed from it in the surface soil. This percentage is not usually considered high enough to threaten injury to crops on heavy loams.

It is desirable, nevertheless, to compare the effects of the lime and

carbonate treatments during the first and last rotations, to observe whether any action is manifest as a result of the accumulation of calcium carbonate in the soil. The comparative yields for these rotations, expressed in ratio with the yields of the adjacent unfertilized plots for the same years, are given below:

	Lime.		Carbonate.	
	First rotation.	Fifth rotation.	First rotation.	Fifth rotation.
Corn:				
Ears,	91.0	82.8	110.6	112.4
Entire crop,	91.4	88.1	115.0	110.5
Oats:				
Grain,	94.3	83.6	104.0	110.5
Entire crop,	99.5	109.2	115.6	118.8
Wheat:				
Grain,	94.4	108.9	86.2	119.8
Entire crop,	92.7	109.9	88.5	122.2
Hay,	87.8	95.9	98.6	118.0

Judging from these data the heavy applications of lime injured corn and oat grain yields more after the first rotation, but the crops of intermediate rotations show that it was not a distinctly increasing degree. On the other hand, the use of lime depressed the wheat yield at first, but increased it in later rotations and injured hay less. The carbonate shows little change in effect upon corn and oats during later rotations, but depressed the wheat and hay yields at first and increased them in later years.

Certain crop peculiarities are apparent in consequence of these treatments: The leaves of corn on the carbonate plots have a healthy green color; those of plants on the lime plots are yellow when young, and striped with deep red colors when mature. On both sets of plots clover far exceeds timothy; the ratios between ear and stalk show a slight increase of stalk in corn after either treatment, practically no change in case of wheat, but a very marked increase of oat straw in proportion to the grain, an increase somewhat the more pronounced with the lime treatment, but visible with the carbonate treatment also.

The crop results justify the statement that the use of lime in the manner adopted for these experiments and under the conditions previously mentioned cause a net decrease rather than a gain in production; whereas, the carbonate of lime exhibited a slight increase, but entirely insufficient to pay for the cost of the carbonate applied.

Partial analyses of the soils of these plots made 18 years after the experiments were begun showed the presence in the soil treated with carbonate of lime, of practically the same amount of organic carbon as in the unfertilized soil, and somewhat less active humus; whereas, the limed plots showed one-eighth less organic carbon and one-tenth less active humus than the unfertilized plots. That is to say, the lime used in excess tended clearly to depress the humus supply

in the soil. Nevertheless, the rate of decrease was very slow, and where manure was used in moderate quantities with lime the humus content did not diminish.

In the case of the nitrogen, likewise, the carbonate plot shows a distinct gain over the unfertilized plots, whereas, the limed plot exhibits a deficiency amounting to one-eighteenth of the entire quantity in the unfertilized soil—a decrease readily accounted for when the liberation of ammonia and more rapid destruction of humus in limed soils are considered. When, however, manure was used with lime, the soil showed a very pronounced gain in nitrogen far exceeding the proportion of gain in humus in the same plots. That is to say, in the manure, as in the soil, the influence of lime leads to a more rapid destruction of carbonaceous than of nitrogenous matter.

To conclude, the use of crushed limestone in large quantities applied biennially was slightly advantageous, both as regards crop yield and influence upon the humus and nitrogen supplies of the soil, while the use of corresponding quantities of lime, applied every four years, led to diminished crop yields, other than those of wheat, and to a slight but appreciable diminution of humus and nitrogen in the soils. It is probable that the relative gain in the soil nitrogen and the crop increase were collectively sufficient in this case to pay the extra cost of the carbonate.

Considering, however, the fact that the use of lime in these experiments was highly excessive, that the soil had, when the experiments began, no particular need for the addition of lime, and that the losses of soil and crop from its use were not very great, it is improbable that the results above stated would warrant Pennsylvania farmers who are tilling and cropping heavy clays and loams in substituting the more expensive and less perfectly distributable crushed limestone for the much more cheaply and perfectly subdivided, slaked lime used in equivalent, moderate quantities.

A Member: Then you do not advocate the free use of lime?

DR. FREAR: Not always; but I think the question resolves itself into this: whether the soil contains sufficient lime for the amount of humus that is in it, and the texture. Now, in light soils there is not so much danger in the use of lime, but we have very few soils and it is a common experience that we cannot use much lime to advantage. I might refer to the soils of Rhode Island and of France as examples of the tendency to decrease the product by the use of the lime.

MR. STOUT: Do we apply enough fertilizer in the shape of lime for the use of our crops, whether we use the raw rock or the acidulated fertilizer?

DR. FREAR: Yes. I think I might answer that the average farmer of Pennsylvania is applying to the land in one form or another practically all the calcium which the crops remove. We have to consider the tilth of the soil, and the amount of lime carbonates in the soil also in this connection and not put on the lime for the sole purpose of applying it.

MR. WING: I would like to ask a question. I would like to know whether the crushed limestone will really destroy plants from the soil?

DR. FREAR: I find that it will practically destroy the humus.

MR. WING: I had an idea that it would not.

DR. FREAR: It does so more slowly, and therefore on soils of slow growth, or on light soils, the carbonate of lime should be used. When the limestone is air-soaked it loses a large part of its causticity and in a slight application of six, eight or ten bushels the danger is very much less.

A Member: We have in our country what is known as a carbonate of lime and also what is known as magnesia of lime. Does the magnesia affect the soil in the same way?

DR. FREAR: I have given some attention to this, and I believe that if the magnesia of lime is present in very great quantities it might do so, but from what I have gathered from the use of magnesia of limestone throughout the State the danger is very slight, but the magnesia is found only in limited portions of the State.

MR. WING: In my part of Ohio you will find a great deal of this magnesia of limestone. The glacial action ground up the limestone and if you dig down under the ground six inches you will find a great many pebbles of magnesia limestone, some of them as large as hen's eggs.

At this point the discussion was broken off by the entrance of the Hon. Edwin S. Stuart, Governor of Pennsylvania, who, upon being presented by the Secretary, spoke as follows:

ADDRESS OF GOVERNOR STUART.

Mr. Chairman and Members of the State Board of Agriculture: I have been a very busy man since I came to Harrisburg, and consequently have not had time to make any preparation for my talk to the Board today; but I desire to assure you that there is no body of citizens in this State for whom I would be willing to do more to advance their interests than for the farmers of the State of Pennsylvania. (Applause.) I understand from some statements over which I glanced today that the farm products of Pennsylvania are greater than almost any other State in the Union. That alone would make any citizen proud of the State, and I assure you that you are not more so than I am. I cannot, perhaps, talk to you with as great knowledge of farming as some of my predecessors, but any man who has been Governor of Pennsylvania understands the value of the work done by farmers, not only as farmers, but as citizens. In all my knowledge of the people of Pennsylvania there has been no more

law-abiding people and no people quicker to add to the worth of the State and the Union than the farmers of this State and other states. (Applause.)

But there is one thing that I can't help talking about, and that is where I know that the farmers, outside of their farming interest, have been of great help to the cities of the Commonwealth. In all of the cities, particularly in the city where I come from, and where I have spent all my life, some of the best citizens have come from the farmers of Pennsylvania. Some of its most prominent men in profession and business have been farmers' sons who have come to the city. Many of its representative men in business and philanthropy have been the boys who were trained at the country fireside, and have there been taught the duties of citizenship, and they have done and are doing everything to make the city better as well as adding to the growth of the State of Pennsylvania.

I don't want to talk long today, but I want to thank you for sending that committee to me and to assure you how highly I appreciate you. And while the farmer, like many other citizens of the State, may have a great deal to ask for that it is impossible for me to give him, I will always be ready to hear and talk, and do everything in my power to advance the cause of one of the greatest interests of the State, and one which may not have been as highly appreciated as it should have been by those making appropriations, and anything I can reasonably do, I will do to advance the cause of the great farming interests of our Commonwealth. (Applause.)

The CHAIRMAN: The discussion of the lime question will be continued.

MR. WING: I would like to continue my remarks about the magnesia limestone in my own country. Now, there are grown in our country, round about me, probably 10,000 tons of alfalfa each year, and it grows so easy that it seemed to us it would grow anywhere. It seemed to us that it grew to advantage in the soil containing the limestone pebbles. But I have seen farmers in Pennsylvania who put loads of manure on their land, fail to grow alfalfa, and, knowing the character of our land at home, where we grow alfalfa so easily, it seemed to me that the land must be deficient in limestone. I began to think it was because the limestone pebbles in our soil would not neutralize the acid of the alfalfa and red clover that we grew them so easily, while in other countries where they have not these limestone pebbles, and cannot grow it, the acids must become neutralized by the lack of limestone. That is the reason I was sorry to hear the Doctor say the lime would do harm. One hundred tons of crushed limestone would make eight tons to the acre in a twelve-acre field, and I have been advising some of the farmers who failed to grow alfalfa to try it, and I am sorry if I have misled them.

DR. FREAR: I don't think that Mr. Wing has been giving these people advice that will lead to their injury or loss. The question does not apply to acid that is needed by the land in the form of crushed limestone, but do not apply it in the form of slaked lime. As I have shown this morning, the carbonates of lime are not nearly so harmful as the use of the lime itself.

MR. WING: How much does crushed limestone cost you here?

DR. FREAR: About \$6.50 on the average.

MR. WING: We have the advantage of you in Ohio. We can get it on cars at \$1. I have thought, though, that it is like throwing away money to put six, eight or ten tons of lime on the land to prepare it to grow alfalfa. Several years ago when I was in England and France I saw the deep pits from which the lime had been taken, and saw the trees banked up with it, and I asked Mr. Yates what those pits were. He told me that was where they had taken out the lime to grow clover. Nothing in the world is better for this purpose than lime.

DR. FREAR: The carbonates, but not the slaked lime.

MR. WING: I never saw such clover as they grew there, and as the clover is a good preparation for the alfalfa, I thought that if crushed limestone would do this, it would be a safe investment at a dollar.

The CHAIRMAN: Anything further?

MR. HARGETT: I am a stranger here, and did not hear all that was said. May I ask whether the question refers to ground limestone or some other particular form of it?

DR. FREAR: Just the rock.

MR. HARGETT: Our experience in Maryland has been that burning the rock is the best way to apply it.

DR. FREAR: In 1859 the whole of the College Farm was thoroughly limed, and now, after a period of about forty years, we find that here and there further applications will be necessary. Had this lime been put on in the form of carbonate of lime, rather than in the form of a caustic, the effect would have been complete in a very short space of time.

MR. WING: May I ask for further information regarding the plots you have at your college? I was interested in your reference to them. You gave the figures for twenty years, did you not?

DR. FREAR: In my paper today I gave the figures for twenty years; it is now in its twenty-seventh year.

MR. WING: I did not have the figures and therefore did not know. In Kentucky and Tennessee the soil rests upon a very hard limestone, and therefore the people there have presumed that they did not need this lime; but, I suppose, the world has been leaching for six thousand years and they are now feeling the need of it, and I have discovered that where they have begun to use the limestone, the growth of the crops has been doubled in a few years.

MR. STOUT: I would like to ask the Doctor whether this limestone that is being sold throughout the country as high as \$20 per ton has any advantage over the ordinary crushed rock?

DR. FREAR: I can't answer that from my own experience, since we have not experimented with it, but Prof. Patterson, of Maryland State College, gave it a trial and found it an excellent caustic lime, but I do not believe that I would pay \$20 a ton for it, and I would advise my farmer friends of Pennsylvania that the difference between eight or nine cents per bushel and that amount would be too great, even if it had several advantages over the ordinary caustic lime.

The CHAIRMAN: Is there anything further? If not, what shall be done with this paper?

On motion, duly seconded, it was agreed to receive it and place it on file.

MR. HERR: I move that we take a recess of fifteen minutes to greet the governor.

Duly seconded and agreed to.

After the recess, during which time all members and visitors fell in line and shook hands with the Governor, business was resumed as follows:

The CHAIRMAN: We will now be addressed by Prof. Hunt, of State College.

Whereupon Prof. Hunt spoke as follows:

THE PROMOTION OF AGRICULTURE IN PENNSYLVANIA.

A COMPARISON.

BY PROF. THOMAS F. HUNT, *State College, Pa.*

Coming from a sister State to the State of Pennsylvania to become the Dean of your School of Agriculture and Director of your Experiment Station, I might, perhaps, be expected to outline in a somewhat comprehensive manner the policies which will actuate me in the performance of the duties which will be placed upon me by the board of trustees of the Pennsylvania State College. This, however, I shall not this morning attempt to do for several reasons.

In the first place, the general aims and purposes of the School of Agriculture and Experiment Station are now fairly well understood and do not need stating to an audience of this character.

In the second place, I do not expect to change in any radical way the policies which have been pursued under the most excellent administration of Dr. H. P. Armsby and his associates. I do hope to add to and extend the agencies already existing. I believe in evolution, not revolution. The way to repair a leak in the roof is not to tear down the house and build a new one. The better way is to add some new shingles.

In the third place, I wish to take the brief time that is at my disposal in talking to you of ways and means rather than of ideals and operations, of finances instead of fancy. Perhaps it is just as well that I do not have time to draw for you the picture which I see painted against those beautiful hills in Centre county, where, amid

pure air and wholesome surroundings, stands an institution which contains potentialities of which Judge McAllister and Judge Beaver in turn have dreamed for fifty years, but the fruition of which has been delayed, at least in part, because the great and splendid State of Pennsylvania, whose very name is taken from the disciple of the art of peace and whose resources are almost boundless, has never been shown the way, or, having been shown it, has not been able to follow the path.

If I should paint for you the picture you might think me a dreamer of the dreamers, and having painted it, in after years you might make comparisons between the dream and the actualities. Furthermore, I want you to think of me as a very practical, close to the earth sort of an individual that has to deal with accounts and unpaid bills, appropriations and other mundane and sordid affairs.

If I were to give my address a title this morning it would be "The Promotion of Agriculture in Pennsylvania. A Comparison."

I invite your attention first to a table showing the agriculture of the four most populous and wealthy states in the Union in order of population and wealth: New York, Pennsylvania, Illinois and Ohio. These states have been chosen because they are the states that are in the same class with Pennsylvania. What Vermont, or Florida, or Idaho are doing to promote agriculture can be of little interest to us at this time, since they are not in our class.

The agriculture of these four states is somewhat similar, as shown by the following table:

	Pennsylvania.	New York.	Ohio.	Illinois.
Total value of farm property in million dollars,	1,051	1,070	1,199	2,004
Total value of farm products in million dollars,.....	207	245	257	345
Number of million acres of farm land,	19	23	26	33
Number of million acres of improved farm land,....	13	15	19	23
Value of farm products per acre,	\$10 90	\$10 70	\$9 90	\$10 50
Value of farm products per acres of improved land,...	16 00	15 30	13 50	12 40

The figures in this table are not given to prove the relative profit in farming in the several states. They are given to show that Pennsylvania has an agriculture that is worth while. They prove beyond peradventure that Pennsylvania is a great agricultural State. The reason that some other states are considered greater agricultural states than Pennsylvania is not because their agriculture is so much greater, but because their other industries are so much less. Take the State of Nebraska. You think of it as a great agricultural state, and it is. A state that, practically speaking, has neither lumber, nor building stone, nor iron ore, nor coal, nor oil, nor gas, and not even falling water enough to create electric power, must of necessity be an agricultural state if it is going to be anything. As a matter of fact, Nebraska is three-fourths larger than Pennsylvania, and the value of its farm products were, in 1899, about three-fourths that of Pennsylvania.

Aside from the four states mentioned in this table, if we assume the value of the farm products to be a measure of the agriculture of

the state, then there are five other states that may fairly be considered to be in the same class with Pennsylvania, viz: Iowa (365), Texas (239), Missouri (219), Kansas (210), and Indiana (204).

While these figures do not show the profit in farming, it may be well to point out in passing that the two great eastern agricultural states, Pennsylvania and New York, stand out from their sister states further west in producing a larger quantity of what may be called expert farm products—products requiring expert knowledge and skill, such as fruits, flowers, vegetables, dairy products and poultry. Further, there are greater opportunities for development along these and similar lines. I believe the passage of the National pure food meat inspection laws are not only going to be of vast benefit to the consumers, but also to the eastern farmers who desire to produce an honest, high grade article. But I am to discuss certain phases of that subject before the State Breeders' Association tomorrow and will not pursue it further now.

I wish to call your attention to what is now being done elsewhere to promote agriculture. For this purpose I have chosen the State of New York. New York and Pennsylvania are alike in three important particulars:

1. They have about equal ability to promote agriculture.
2. Their agriculture is much alike in quantity and kinds, in some respects as much alike as two peas.
3. The market problems are much the same.

All of which bring about similar need of activities both on the part of your State Department of Agriculture and your Experiment Station.

Appropriations for promotion of Agriculture by the New York State Legislature of 1905-6.

Funds available from October 1, 1905, to September 30, 1907.

General expenses, department of agriculture,	\$337,570
Bureau of farmers' institutes,	40,000
Horticultural inspection,	50,000
Agricultural statistics,	7,800
Diseases of domestic animals and litigation and payment for cattle,	69,603
Pure food, feeding stuffs and fertilizers,	21,500
Sugar beet industry, including inspection,	65,131
State fair commission and buildings,	190,350
Premium at county fairs,	476,327
New York State Experiment Station for maintenance and new buildings,	170,500
New York State Colleges for maintenance and new buildings,	372,360
New York State Veterinary College for maintenance,	50,000
School of agriculture in St. Lawrence County,	80,000
	<hr/>
	\$1,931,141

Of the above, \$672,860 is for education and research.

Appropriations for promotion of Agriculture by the Pennsylvania State Legislature for 1905-6.

Funds available from October 1, 1905, to September 30, 1907.

State Board of Agriculture,	\$3,500
Department of Agriculture,	90,000
Dairy and Food Division,	174,800
Nursery inspection,	60,000
Feeding stuffs,	5,000
Special investigations,	5,000
Diseases of domestic animals,	40,000
Live stock sanitary board,	90,000
University of Pennsylvania, buildings for veterinary medicine,	100,000
School of Agriculture, Pennsylvania State College, buildings,	77,500
School of Agriculture, Pennsylvania State College, maintenance,	30,000
Experiment Station, Pennsylvania State College, maintenance,	10,000
	<hr/>
	\$685,800
Returned to State Treasury by Dairy and Food Division,	162,580
	<hr/>
	\$523,220

The agriculture of a state may be promoted in three ways: First, by research or scientific experiment to determine new truths relating to agriculture; second, by education in and for agriculture; and third, by the enforcement of the laws and other executive and police powers. These three functions are by no means the exclusive functions of the state and are not exercised exclusively by the state, but the state has recognized that they are state functions by the establishment of the Department of Agriculture for executive and police functions at Harrisburg and by the establishment of the School of Agriculture and the Experiment Station at State College. I have shown you that the State Department of Agriculture has plenty of precedent in asking the Legislature for its just needs; that it is conducting its executive enterprises and police powers at very much less cost than New York State. It would not be proper for me to say anything further about the development of the Department of Agriculture, but I may without impropriety outline to you briefly what the needs of the State School of Agriculture and the Experiment Station at State College are. I am able to do this largely as an outsider. Frequently one can see a situation from the outside perhaps better than if he were on the inside.

I next invite your attention to the annual appropriation for maintenance of agricultural education and research, that is, exclusive of buildings or betterments, in the four states of Pennsylvania, New York, Illinois and Ohio for the present fiscal year:

Agricultural Education and Research—Maintenance for Current Year.

	Total income.	By legislation.
New York,	\$223,800	\$188,700
Illinois,	181,000	131,000
Ohio,	150,725	110,485
Pennsylvania,	55,000	20,000

The activities of an institution may be shown by other ways than the money expended. The employees devoting themselves to agricultural education and research are as follows:

	Teachers and scientific workers.	Other employees.	Total.
New York,	94	63	157
Illinois,	48	63	111
Ohio,	35	48	83
Pennsylvania,	20	23	43

If a person has never had to prepare a budget for the maintenance of a school of agriculture and experiment station, he can hardly realize how much money it takes. Having been called upon to prepare such a budget I give you the result of my investigations.

The budget submitted by the Dean and Director to the Executive Committee of the Pennsylvania State College for the next two years is as follows:

Budget of the School of Agriculture and Experiment Station, The Pennsylvania State College.

	1907-8.	1908-9.
1. Dean and director's office,	\$26,020	\$26,020
2. Agronomy,	8,100	8,600
3. Agricultural chemistry,	4,200	4,500
4. Agricultural extension and short courses,	3,500	3,500
5. Animal husbandry,	8,400	11,900
6. Botany,	5,800	5,800
7. Correspondence courses and poultry husbandry,	13,080	13,280
8. Dairy husbandry,	10,400	10,400
9. Experimental agricultural chemistry,	13,540	14,540
10. Forestry,	4,500	6,800
11. Landscape gardening and floriculture,	5,400	5,400
12. Horticulture,	5,300	6,500
13. Zoology and entomology,	2,300	2,500
14. Rural engineering, .....	.....	4,700
15. Home economics, .....	.....	9,000
Experiment station,	15,000	20,000
Institute of animal nutrition,	13,000	13,000
Total,	\$138,540	\$166,440

The question has been raised, and therefore may occur to you, as to the character of the expenditures in the Dean's and Director's office. The following table gives an analysis of the budget for this office.

Salaries,	\$8,220
Expenses of Station farm,	3,500
Publications,	3,500
Stationery, postage, etc.,	1,000
Library,	1,000
Traveling,	500
Repairs,	1,500
Janitor services,	1,000
Contingent,	1,000
Emergency fund,	4,800
	<hr/>
	\$26,020

Of this amount, \$15,160 will come from Federal funds; \$10,860 is asked of the State Legislature.

The Experiment Station will receive from the Federal Government \$24,000 for the fiscal year 1907-8, and \$26,000 for the fiscal year 1908-9, and its estimated annual income from fertilizers is \$13,000. Deducting these items from the budget stated above, there will be required for maintenance about \$100,000 for the fiscal year 1907-8, and \$125,000 for the fiscal year 1908-9.

The Executive Committee has estimated that \$100,000 will be required to complete and equip the new agricultural building and complete the equipment of the dairy building. A new building is required for forestry, horticulture, zoology, and entomology at a cost of \$100,000. Some additional buildings are required for poultry husbandry, and two residences are required, one for the Dean and Director and one for the poultryman. The Executive Committee are therefore asking \$125,000 for new buildings. If all these requirements of the School of Agriculture and the Experiment Station are to be provided for by the State Legislature, the appropriation must be as follows:

Maintenance for 1907-8,	\$100,000
Maintenance for 1908-9,	125,000
Completion and equipment for Agricultural building, ..	100,000
Buildings for Forestry, Horticulture, Zoology, Entomology, Poultry, and two residences,	125,000
	<hr/>
Total,	\$450,000

The question now arises as to what would happen to the Pennsylvania State College if the State Legislature should increase the appropriation for that institution.

**Income of the College of Agriculture and Experiment Station in
the University of Illinois during ten years:**

Year.	Funds.	Teachers and Investi- gators.	Agricultural students.
1897,	\$22,000	8	19
1898,	22,000	9	25
1899,	43,000	16	90
1900,	43,000	17	159
1901,	103,000	28	232
1902,	103,000	27	284
1903,	190,000	37	339
1904,	190,000	37	406
1905,	201,000	44	430
1906,	201,000	48	450

It is evident from this table that the amount of money and the number of teachers have something to do with the number of students.

The Pennsylvania State College is not merely an Agricultural School and an Agricultural Experiment Station. It is, in fact, a State University, since it is a collection of schools, the most important of which in point of development and number of students is the Engineering School. Probably three-fourths of all the students attending State College are in the Engineering School, which takes high rank among the Engineering Schools of the country. I, myself, am interested especially in the School of Agriculture and the Experiment Station, since I am to be charged with the responsibility of their development. I, however, recognize the very simple mathematical proposition that the whole is greater than any of its parts. I am also a firm believer in the proposition that the place to educate a boy or girl is where there are a number of strong schools. I do not believe in the monastery or the convent or the single course college for the education for the world's work.

I happen to know that there are a number of people who are afraid that the promotion of agriculture may prevent the proper development of other schools at State College. I am glad of the opportunity to say before official representatives of the farmers of Pennsylvania that I expect to see the other schools of State College promoted and supported by the farmers of the State just as cordially as the School of Agriculture. The School of Agriculture may grow without preventing the growth of a State institution. This may be illustrated by the University of Illinois, the growth of whose College of Agriculture I have just shown you in this table. The following table gives the total income and the total number of students in the University of Illinois:

	Income.	Students.
1897,	\$212,000	1,582
1898,	212,000	1,824
1899,	330,400	2,234
1900,	330,400	2,505
1901,	430,330	2,932
1902,	430,330	3,289
1903,	613,000	3,594
1904,	613,000	3,729
1905,	787,035	4,074
1906,	787,035	4,374

I have tried to show in the figures which I placed before you that this beautiful and flourishing State of Pennsylvania, while less of an agricultural state relative to its other industries than some others, is absolutely one of the first eight or nine agricultural states of the Union. That in gross returns for an acre of land actually tilled, its farmers lead some of the more important states. That your farmers need aid through agricultural education and research and through the executive and police powers exercised by your State Department of Agriculture does not admit of debate. While your resources are boundless, it is obvious that what you are doing to promote this great basic industry falls far short of what other states have seen fit to do. If I were speaking to a body of men who had no interest in agriculture, I might appeal to them from the standpoint of their civic pride, but before this society, officially recognized as the society which is organized to promote in every way within its power the calling of agriculture, may I not appeal to your business sagacity? Need I point out that in spending money in the promotion of agriculture, the Commonwealth is merely advancing money which will be returned to it manifold in future years?

MR. HALL: I think that the Board should express its appreciation of this paper by a rising vote of thanks.

MR. CLARK: The committee in charge of the "Dog Law" is prepared to report at any time you may wish.

The CHAIRMAN: We will be ready to listen to that report.

MR. CLARK: At any time you are prepared.

The CHAIRMAN: Right now.

The Committee on "Dog Law" thereupon made the following report:

REPORT OF COMMITTEE WITH REFERENCE TO DOG LEGISLATION.

First, we realize the dog is here to stay, and to gain control of this animal we would recommend the following means of accomplishing this end. First, that all dogs be registered and to wear a collar or tag bearing the number of said registry.

Second, to accomplish the registry, we would recommend that the first registry shall be made by the assessor when he makes his fall assessment by registering all dogs, to take a short description of the animal and issue tag or collar with number, after the owner has paid the fee of \$2.00 for each dog so registered, which shall be paid to the assessor at that time or the tag refused, and after the time of the assessor making his returns, it will be the duty of the constable to destroy all dogs not registered, and be paid for this duty \$2.00 and mileage for each dog killed and buried, and when making his reports to the Court, he shall also state that he has complied with the instructions of the Dog Law in killing all dogs not registered.

Third, as to the disposition of this tax, we recommend that this shall be left in the hands of the commissioners of each county as to what it shall be applied to.

All laws that would interfere in the carrying out legislation of this kind shall be repealed.

M. N. CLARK,
S. S. BLYHOLDER,
N. B. CRITCHFIELD.

The CHAIRMAN: What shall be done with this report?

On motion, duly seconded, the same was received and adopted.

MR. NORTON: Mr. Chairman, Ladies and Gentlemen: If you are ready to adjourn, we will be ready to start the milking machine at half past eleven. We will operate it again from four to half past four this afternoon, and from ten to half past ten this evening. Now, we will probably be crowded for space, and if you can't all get there at this time, we will be glad to see you there later.

The SECRETARY: The election of officers was to take place at this time, but it is for the Board to decide whether they want to postpone it, or proceed with the election now.

On motion, duly seconded, it was agreed to proceed with the election of officers at once.

The CHAIRMAN: Before proceeding with the election of officers, we should dispose of Prof. Hunt's paper. I should like to hear a motion in regard to it.

MR. HERR: I move that the paper be received and published with the proceedings of the Board.

This motion was duly seconded and agreed to.

The CHAIRMAN: We will now proceed with the election of officers. I shall be pleased to receive nominations. The first in order, I believe, is nominations for vice presidents.

MR. SCHWARZ: I nominate Mr. Fenstermaker.

MR. McHENRY: I wish to place in nomination the name of one of our oldest members, Joel A. Herr.

A Member: I nominate Mr. M. N. Clark.

MR. CLARK: I think you had better take my name off the list. I may not be able to serve, and therefore ask to withdraw my name.

A Member: I offer the name of Mr. E. E. Chubbuck.

MR. BARNES: I wish to nominate Geo. G. Hutchison.

MR. HERR: I nominate Mr. McClellan.

MR. FENSTERMAKER: If the Board will allow me, Mr. Schwarz has kindly mentioned my name, but I have had the honor once, and I will be glad to withdraw.

MR. SCHWARZ: I did that because I thought, since the meeting is to be held at Allentown, we should have a vice president from there.

MR. FENSTERMAKER: Not necessarily. I appreciate the motive, but if the Board will allow, I beg to withdraw my name.

MR. SCHWARZ: Inasmuch as we now have three names, I move that they be elected by acclamation.

Duly seconded and agreed to.

The Secretary was directed to cast the ballot for Messrs. Herr, Chubbuck, and McClellan as Vice Presidents.

The CHAIRMAN: Will the first Vice President please take the Chair.

MR. HERR: I don't think he begins to serve until the next meeting.

The CHAIRMAN: I think it is customary for him to take the Chair as soon as elected.

Mr. Herr thereupon took the Chair and said: "I have always taken a deep interest in the Board and I appreciate the honor you have conferred upon me. We are now ready for nominations for the Executive Committee, on which there are nine members."

The following gentlemen were nominated to serve on the Executive Committee: Messrs. Snively, Blyholder, I. A. Eschbach, Stout, Clark, Naginey, McGowan, Seamans.

MR. SCHWARZ: I move that the nominations close and we elect these gentlemen by acclamation.

Duly seconded and agreed to.

The SECRETARY: I take pleasure in casting the ballot for the election of these gentlemen.

MR. KAHLER: I would like to make this announcement: That the members of the Legislative Committee are requested to meet in the little room back there at half past one o'clock. If there is anything to come before the committee I would like to know it before that.

MR. HALL: As a member of the Board, I am not willing that the information we have received from Prof. Hunt this morning should go with so meager a recognition. It seems to me that his paper

gives us the information we needed regarding the status of this State, and I move you, sir, that a vote of thanks be extended to him and that the entire amount asked for be endorsed by this Board of Agriculture.

MR. BLYHOLDER: I think we should divide up that question. I don't think we can legally vote on the two things at the same time.

The CHAIRMAN: We will take a vote on the first part, to extend a vote of thanks to Prof. Hunt.

Agreed to.

MR. YOUNG: I think the easiest way to bring this information before the Legislature is for Prof. Hunt to go there and deliver this lecture.

The SECRETARY: Do you make a motion that Prof. Hunt be requested to go before the Legislature and deliver that lecture?

MR. YOUNG: I do.

The SECRETARY: I think the best way would be for him to go before the Appropriation Committee of both the House and the Senate, and then the members can come in and listen to it. I am afraid he would have trouble in getting a hearing right in the House.

MR. HALL: I don't want to take up all the time, but there is one practical thing all of us can do: We can go home and see the members who represent our county, and urge upon them to stand up for this appropriation, and in that way we can help the thing along.

The CHAIRMAN: That is a very good idea.

MR. NAGINEY: I would suggest that we see our county representatives before we go home. They are all here now and can easily be reached. I think it will be better for us to see them before the Professor delivers his lecture.

The CHAIRMAN: And if you can't do that, you all know how to write.

On motion, duly seconded, adjourned until 1.30 P. M.

Wednesday, January 23, 1907, 1.30 P. M.

The Convention opened this afternoon with Mr. Herr in the Chair.

The CHAIRMAN: Is the Executive Committee ready to make a report?

MR. STOUT: As one of the Committee, I can make a report if desired.

The CHAIRMAN: Mr. Stout, a member of the Executive Committee, will make the report.

REPORT OF EXECUTIVE COMMITTEE.

MR. STOUT: The Executive Committee have named the following Committees; you will notice that there are a few slight changes from the committees as they now stand. (See pages 7 and 8.)

The CHAIRMAN: The program now calls for the Report of the Committee on Floriculture, Edwin Lonsdale, Chairman. I do not see Mr. Lonsdale here. Have you his report, Mr. Secretary?

The SECRETARY: Mr. Lonsdale asked permission to send in his report a little later, and have it printed with the proceedings. What is the pleasure of the Board in regard to that?

The CHAIRMAN: What shall be done regarding Mr. Lonsdale's report?

On motion, duly seconded, it was agreed to receive the report and place it on file for publication with the proceedings of the meeting.

The CHAIRMAN: Next comes the Report of the Committee on Forestry. Is Mr. Piatt here?

It appeared that neither Mr. Piatt nor his report were there.

The CHAIRMAN: We will then go on to the next paper, the Report of the Committee on Cereals and Cereal Crops, by S. X. McClellan, Chairman.

Mr. McClellan then read his report, as follows:

REPORT OF THE COMMITTEE ON CEREALS AND CEREAL CROPS.

BY MR. S. X. MCCLELLAN, *Chairman*.

This is a subject that is worthy of more consideration than is generally given to it, as it is of vast importance to all classes of people, as the production of cereal crops is by far the greatest industry of the present day. It requires more brain, muscle and money than any other one branch of business, because it is the motive power of the nation. The corn crop for 1906 in itself will show the vast amount of revenue it produces, and that is only a part of the great industry. The total number of acres of corn in the United States for the year 1906 was 96,737,581, and the average yield per acre was 30.3 bushels, making 2,927,416,091 bushels. The average price per bushel 39.9 cents, making in all \$1,166,626,479.

Winter Wheat came next in value. The total acreage for 1906 was 25,599,961, and the average yield per acre was 16.7 bushels, making the total number of bushels 492,888,004. The average price per bushel was 68.3, making a total value of \$336,435,081. Of Spring Wheat there was 17,705,868 acres; average bushels per acre 13.7, making a total of 242,372,966; and the average price per bushel 63½ cents, making a total of \$153,897,679.

The Oats crop of 30,958,768 acres, with an average yield of 29½ bushels per acre, making a total of 964,904,522 bushels, at an average price of 31.7 cents per bushel; total value of same being \$306,-292,978 for oats alone.

Next comes Barley, there being 6,323,757 acres at an average yield of 28.3 bushels per acre, making a total of 178,916,484 bushels, at an average of 41½ cents per bushel, making \$74,235,979 for that crop.

The next crop in value comes Rye. Now, I do not think they base their estimate on this crop from what it costs the consumer when made into whiskey and sold at from 10 cents to 15 cents per glass—and if you notice, the glasses are not as large either—but we find the total acreage to be 2,001,904 acres, making an average of 16.7 bushels per acre, which makes 33,374,833 bushels at an average of almost 60 cents per bushel, making \$19,671,243 for rye alone.

Buckwheat, considered by a large number of farmers as not a profitable crop, shows up an acreage of 789,208 acres—average bushels per acre 13.6, making a total of 14,641,737 bushels, valued at 59.6 per bushel, making \$8,727,443 worth of buckwheat.

Of Flaxseed there were 2,505,927 acres, making an average of 10 1-5 bushels per acre, or a total of 25,576,146 bushels, at an average of \$1.012 per bushel, making a sum equal to \$25,899,165. And the Rice crop shows an acreage of 575,014 acres, at an average of 31.1 bushels, making 17,854,768 bushels, at an average of 90.2 cents per bushel, making the sum of \$16,121,298.

The state that shows the largest acreage of corn is Illinois, 9,616,886 acres. The state showing the lowest number of acres is Wyoming, 2,528 acres. Ohio ranks first in number of bushels per acre, 42.6, and good old Pennsylvania third. Florida, the lowest, with 11 bushels per acre. Iowa produced the greatest number of bushels, 373,275,000, and Wyoming the lowest, 68,256 bushels. Arizona, the highest price per bushel, 85 cents. Oklahoma, the lowest, which was 30 cents per bushel. Illinois ranks first in the value of the corn crop, being a total of \$124,981,051, and Wyoming the lowest, \$40,271. Kansas leads in acreage of winter wheat, with 5,131,800 acres, and Alabama the lowest, with 1,761 acres. Idaho leads in the number of bushels per acre, which is 25.4, and North Carolina lowest, with 9.1 bushels per acre. Kansas leads in the total number of bushels, having 78,516,540, and Mississippi the lowest, with only 17,610 bushels. South Carolina shows the highest average price per bushel, with \$1.10, and Oklahoma the lowest, 55 cents per bushel.

In Spring Wheat growing states, North Dakota leads in acres, with 5,992,000, and Arizona lowest, with only 15,542 acres. Colorado has the greatest number of bushels per acre, 32½, and Minnesota the lowest, being 10.9 per acre. North Dakota leads in the total number of bushels, having 77,896,000, Arizona lowest, with 391,658 bushels, and she also leads with the highest average price per bushel, being \$1.03, and Nebraska the lowest, at 57 cents per bushel. North Dakota leads in the total amount of dollars, with \$49,074,480, and Arizona lowest, with \$403,408 to her credit.

Oats is produced in every State and Territory of the United States. Iowa leads in the number of acres sown, with 4,165,000 acres, and Arizona lowest with only 914 acres. Utah leads in average of bushels to the acre, being 43.7 per acre, and Florida the low-

est, with 14 bushels, per acre. Iowa produced the greatest number of bushels, having 140,777,000, and Arizona the lowest, with 31,442 bushels. Florida had the highest average price per bushel, being 68 cents, and South Dakota the lowest, with 25 cents per bushel. Iowa leads in total amount of dollars, being \$38,009,790 to her credit. In the Barley growing States and Territories California leads in number of acres, with 1,425,000 acres, and New Mexico the lowest, with 556 acres. Utah leads with the highest number of bushels per acre, being 44 bushels, and New Hampshire the lowest, with 21.4 per acre. California leads in the total number of bushels, with 38,760,000, and New Mexico the lowest, with 15,072 bushels. Arizona shows the highest average price per bushel, being 76 cents, and Nebraska the lowest, with 31 cents per bushel. California leads in dollars, having \$20,930,400 to her credit, and New Mexico the lowest, having \$9,458.

All but ten of the States and Territories produce rye, Michigan having 400,000 acres, leads, and Wyoming only 428 acres. Idaho has the best average price per acre, being 25 1-5 bushels. Georgia, the lowest, having only 8.2 bushels per acre. Pennsylvania leads in total number of bushels, having 6,025,011 bushels to her credit, and Wyoming the lowest, with only 8,132 bushels. South Carolina having the highest average price per bushel, being \$1.25, and Nebraska the lowest, with only 44 cents per bushel. In total value of crops Pennsylvania leads, having to her credit \$3,856,007, and Wyoming the lowest, having \$5,855 to her credit.

Buckwheat is grown in only twenty-four or twenty-five states. New York leads with 321,552 acres, and Tennessee lowest, with 527 acres. Maine has the highest average bushels per acre, being 28 bushels, and Iowa the lowest, with 12 bushels. New York has the greatest number of bushels, 6,109,488, and Tennessee the lowest, having 8,432 bushels. Tennessee also has the highest average price per bushel, being 83 cents, and Minnesota the lowest, at 54 cents per bushel. New York leads in dollars, having \$3,726,788 to her credit, and Nebraska the lowest, having \$8,007.

Flax is raised in thirteen to fifteen states. North Dakota leads, with 1,465,745 acres, and California lowest, with 1,042 acres. Wisconsin has the highest average yield of seed per acre, being 14 bushels, and Missouri lowest, with 7.3 per acre. North Dakota leads with total of 14,510,876 bushels, and California lowest, with 12,504 bushels; California and Oregon having the highest average price per bushel, \$1.25, and Idaho the lowest, with 85 cents per bushel. North Dakota leads the list with the value of \$14,801,094, and California the lowest, with \$15,630. About nine states grow rice. Louisiana leads the list, with 308,377 acres, and North Carolina the lowest, with 668 acres. Texas gave the largest yield of rough rice per acre, which is 36 bushels, and Mississippi the lowest, with 20 bushels per acre. Louisiana has the greatest number of bushels, 8,634,556, and North Carolina the lowest, with 19,305 bushels. South Carolina, Florida and Alabama have the same average price of \$1.00 per bushel, and Arkansas the lowest, at 85 cents per bushel. Louisiana has the largest total value, being \$7,771,100, and North Carolina the lowest, with \$18,340.

Taking the total value of these crops they are immense, making a grand total of \$2,107,906,860.

The CHAIRMAN: What shall be done with this report?

On motion, duly seconded, it was received and filed for publication.

The CHAIRMAN: Some of the reports have been omitted. The first of these is the report of Dr. Leonard Pearson, State Veterinarian, who is now with us, and will read his report.

Dr. Pearson's report is as follows:

REPORT OF THE VETERINARIAN.

DR. LEONARD PEARSON, *Harrisburg, Pa.*

The subject of tuberculosis continues to be one of chief interest in connection with the veterinary work of the State. It is a little embarrassing, sometimes, to speak on this rather threadbare theme to this body, that has in recent years heard so much about it. But, so long as there is such need for information in respect to this disease, and I find evidence of it in my daily work, I am sure that you will not resent a brief discussion of it. While the general topic of tuberculosis is an old one, a vast number of men are making investigations in relation to its occurrence in man and animals, and so, from time to time, new facts concerning its nature and new developments in means to combat it are being brought to light.

I take it that the plan of operation of the State Livestock Sanitary Board is known to you, and it has been described in the annual reports of the Department of Agriculture. You are aware that inspections and tuberculin tests of herds are made only upon request of owners of cattle. It has been the opinion of the Board that there is no permanent advantage to the State in completely freeing herds of tuberculosis, by the use of the tuberculin test, and in undertaking a large share of the cost of such operations, if the herds are permitted soon to become reinfected. And it is quite impossible, excepting at enormous expense—by the use of much more money than is at all likely to be made available for this purpose—to keep herds free from infection unless the public authorities have the co-operation—the active assistance—of the owner. Hence, such inspections are made only upon application from herd owners. But, under a new law (No. 56, P. L., 1905), it has become possible to deal with all cases of advanced tuberculosis of cattle that are reported. Still, there is no organization for searching for such particularly dangerous animals, and I regard this the point that next requires consideration.

While we have found that the majority of farmers are alert to the importance of excluding tuberculosis cattle from their herds, and many report tuberculosis when examination shows that this disease does not exist, there are others who are so careless as to keep and use cows with advanced tuberculosis, even with tuberculous udders, and permit such cows to scatter germs of disease for months, until their entire herds become infected—to say nothing of poisoning the milk supply.

Tuberculous cows are dangerous in proportion to the number of tubercle bacilli that are escaping from their bodies. Advanced

cases of disease excrete infinitely more germs than light cases, hence the advanced cases constitute the greatest menace to the live stock industry and the public health. For the purpose of discovering and extirpating these particularly dangerous animals, a systematic inspection of dairy herds is necessary. I have been loth to recommend such an inspection, because I know how unpopular the idea of inspection is. It should be remembered, however, that it is not fair to the careful, clean dairyman to have to compete in the market with a man who has no pride in his work, or regard for the quality or wholesomeness of his product. And it is unfair to permit the worst managed herds to reach such a degraded state as to cast reflection on the whole milk supply. I feel that unbiased consideration of this suggestion must lead to the conclusion that objections to it are based chiefly on sentimental grounds.

Remember that it is not proposed to use the tuberculin test in connection with this inspection, unless it should be necessary to do so to remove doubt in relation to the condition of individual animals. To propose to test all herds with tuberculin would be absurd, and such a suggestion could not be made by any one who knows what he is talking about.

If such an inspection is provided for, the inspectors should, and no doubt would, feel that they are selected to aid, and not to oppress; to assist, and not to hamper; to co-operate, and not to oppose. It would—and I speak advisedly, and from long experience—be in the rarest case that the inspector would have to make the least show of authority. Such inspectors would be of great value to dairymen as peripatetic advisors in relation to the control of other diseases of importance, as abortion, calf cholera, infectious gargets, etc., and in relation to general questions of animal, stable and milk hygiene.

In New York State, there are a dozen or more dairy inspectors appointed by the city of New York, and a project is being considered to increase this corps to nearly one hundred. Such inspectors, appointed and paid by a city, have in mind, first and foremost, the interests of the city. The farmer is not helped by such men—unless most incidentally—and, indeed, one could scarcely expect appointees of Tammany Hall to be able to render much help to farmers, if they would.

If there is to be such an inspection, it should not be conducted by the cities, but by a department of the State government that is affiliated with the agricultural interests of the State, so that it will be with, and not against, the best agricultural sentiment. But, of course, the organization must be of such character that it will meet the very proper and growing sentiment in cities for a purer and more wholesome milk supply.

There are numerous other subjects that I might report to you, but I esteem this to be one of such importance that I wish not to obscure it by other topics. Moreover, I wish to be brief now, because I am on the program for another paper at another session. I hope this subject will receive careful consideration at the hands of this representative body.

A Member: Has there been any attempt made to vaccinate calves?

DR. PEARSON: The vaccination of calves in our experiment work has been very successful. We are now practicing it very freely on quite a number of farm herds throughout the State.

A Member: Is it a protection?

DR. PEARSON: I think it is a protection for the time, but for just how long I do not know. A German authority has stated that the protection is for life; I criticised it, and was severely criticised myself for it; I said it was ridiculous to claim that it protected for life when it had only been tried for a few years. And French tests show that the immunity expires after a certain time, and then the animal is liable to contract the disease. They have found by their experiments that the animal is usually protected for about three years. They have proven this by putting the vaccinated animals in among a herd in which there are some advanced cases of tuberculosis, and noting results, and animals that have been vaccinated for more than that length of time, and which are exposed, show decided lesions of tuberculosis. I find, however, that animals should be re-vaccinated after a period of two years. I look upon the whole treatment as exceedingly interesting and instructive, and of great importance to the farmer.

MR. VAN ALSTYNE: I would like to ask the Doctor how expensive it would be to the farmer?

DR. PEARSON: All the herds that are now being vaccinated are treated at the expense of the State.

MR. VAN ALSTYNE: Exactly what will be the cost to the farmer where the State does not pay for it?

DR. PEARSON: Well, if the Live Stock Board continues to conduct the work it will not be more expensive in the future than it is now; I do not know whether this will be done, but I think it ought to be.

MR. VAN ALSTYNE: But what will it cost the farmer now?

DR. PEARSON: It does not cost anything; the State does it for you.

MR. VAN ALSTYNE: Exactly; but if the State did not do it, what would it cost the farmer?

DR. PEARSON: I do not know what the veterinary surgeon would charge for doing the work, but that would be the chief cost.

The CHAIRMAN: Are there any further questions to ask the Veterinarian? If not, what disposition shall be made of his report?

It was regularly moved and seconded that the report be received and placed on file. Agreed to.

The CHAIRMAN: As Chairman of the Committee on Credentials, I would say that the Lancaster Agricultural Society has elected Hon. W. H. Brosius a member of the Board for the next three years, and I would move that he be elected a member of the Board.

Duly seconded, and agreed to.

The CHAIRMAN: Next we will listen to the report of the Committee on Roads and Road Laws.

Mr. Kuppenburg, Chairman of this Committee, then read the following report:

REPORT OF THE COMMITTEE ON ROADS AND ROAD LAWS.

BY MR. D. A. KUPPENBURG, *Chairman.*

Of the many questions which confront the people of Pennsylvania today, that of road building is of vital importance. The construction of roads is governed by law, hence the necessity of wise road laws. Our present system of pathmaster and nonpaid supervisor has not been in use long enough to warrant a just judgment of its merits. It has been demonstrated, however, that supervisors enter upon their duties with little enthusiasm and marked show of disinterest.

It would seem to your Committee that the first requisite in making and maintaining a good road, would be the location of the roads with proper grades, given by a competent surveyor. Then a law to insure the road being built to the grade given; it too often happens that where a road is properly graded by a surveyor, the road is opened in the cheapest and most unsatisfactory manner, going over steep knolls, or down steep grades, to avoid a little extra expense in keeping the grade. Many country roads should be relaid; taken from bleak hilltops and kept on an easy grade. This, in nearly every case, is possible. If this were done, and the law directing the moving of stone closely observed, our highways would be in much better condition, and would well serve the public until better roads come for our use and the use of the next generation.

The government will look more carefully to the enforcement of the laws regarding the roads over which the rural free delivery is established. The present requirement is: "Roads traversed by mail carriers shall be kept in good condition and unobstructed. Bridges must be kept over creeks and streams not fordable at any season of the year." The government has decided that unless roads travelled by the carriers are properly maintained, the service will be withdrawn. The Postoffice Department now calls on the carriers for reports on the roads where the highway in question is bad. The 35,973 rural delivery carriers now employed cover 863,363 miles daily, and it is unreasonable to expect them to contend with neglected roads.

The inland country roads are primary factors in the commerce of the nation. They are to the city man, the farmer, the lumberman, what the railroad, the rivers and the high seas are to the manufacturer and the coal operator. The growth of the country has been marvellous, and we are now approaching a new era. The time has come when the country road should be made to compare with the part it plays in the nation's progress. As a business proposition we would regard it as advantageous to nearly every township to get

a good macadam road at one-eighth the cost of construction. However, if the township or county is not able to meet the expenditure without borrowing, I question the feasibility of issuing bonds for that purpose. Even though our posterity would reap benefit from such permanent improvements and would not object to sharing the cost, I should much prefer using the means within reach, rather than encumber posterity.

A change in the Act, putting the entire cost of macadam roads on the State, leaving the townships and counties free to use their means for the improvement of roads, not within reach of the State appropriation, would thus benefit those who would receive slight benefit from the macadam road. If the right policy prevails, this will be done and as much money will be available from these sources as can well be expended for the purpose from year to year. Experience shows that there is a limit to State aid, requested, and this will doubtless be the case as long as the counties and townships are requested to pay part of the cost, as small as that cost is.

The sentiment in favor of improvement has been greatly strengthened within the past three or four years. It almost amounts to a general demand, and while we cannot have \$50,000,000 (as in the case of New York State) for immediate use, the appropriation can safely, and should, be increased many millions a year. State Highway Commissioner Hunter has commenced a general survey of all the roads in Pennsylvania, for the purpose of compiling a new map, showing their length and location. As there are 99,041 miles of road in the State, it will require several years to complete the survey. According to the best authority at hand, we have 97,904 miles mtd road, and 1,101 miles of toll road, 2,267 miles of macadam road completed, 162 miles contracted. Only one county in the State that has not applied for State aid, that of Juniata.

Every other county in the State has made application for its portion of the road fund, as well as its share of the \$125,000 set aside for its maintenance. Allegheny and several other counties which asked for funds last year failed to secure their share by neglect of the County Commissioners to apply within the time limit.

Applications on file for State aid in building roads represent 2,267 miles, and of these Commissioner Hunter expects to build 200 miles this year, in addition to the 200 miles already constructed or under way. It has been decided to use part of the automobile license receipts for road building. The fund already amounts to \$24,000, and is expected to reach \$30,000 each year. The annual license fee is \$3.00.

Too much cannot be said in regard to using wide tired road wagons for hauling heavy loads. The wide tire acts as a roller on dirt roads, and entitles the user to one-fourth his road tax, not exceeding \$20.00.

To build a satisfactory earth road, if loose earth is dumped in the middle of the road and consolidated by traffic, the action of narrow tired wheels rolls it into uneven ruts and ridges, which hold water, and ultimately results, if in the winter season, in a sticky, muddy surface, or if it be in the dry season, in covering the surface with several inches of dust. If, however, the surface is prepared with a road machine and properly rolled with a heavy roller, it can usually

be made sufficiently firm and smooth to sustain the traffic without rutting, and resist the penetrating action of the water.

Every road is made smother, harder, and better by rolling. Such rolling should be done in damp weather, or if that is not possible, the surface should be sprinkled if the soil requires such aid for its proper consolidation.

We recommend a steam road roller of sufficient size to be used for rolling the road and crushing stone. If this is not available, then a heavy road roller to be drawn by horses should be used. Also that a change be made in our present appropriation law for good roads, giving all the counties in Pennsylvania an equal right to share the benefits of the appropriation without expense to the county, thereby assisting those most in need of help.

A law providing for the payment of Two Dollars per day to Township Supervisors for a sufficient time to properly transact the necessary road business, would prove of benefit. We fail to find in our present road laws anything to compel a pathmaster to make a detailed report to the supervisor, and therefore recommend that the law make this duty compulsory.

The CHAIRMAN: Gentlemen, you have heard the Report of the Committee on Roads and Road Laws. Are there any questions that you wish to ask on that report? If not, what action will you take on it?

On motion, duly seconded, it was agreed that this report be received and placed on file.

The CHAIRMAN: We will now have the report of Prof. Surface on Entomology.

This report is as follows:

REPORT OF THE ENTOMOLOGIST.

BY PROF. H. A. SURFACE, *Economic Zoologist, Harrisburg, Pa.*

Never in the history of Pennsylvania has there been so much interest taken in insects as during the past year. The reasons for this are as follows:

1. The destructive effects of insect pests have never before been more apparent in wiping out of existence many orchards, and causing very great loss to farmers, fruit growers, and also truckers and gardeners in this State.

2. The very grave results of the accidental introduction of the Gypsy Moth and the Brown Tail Moth in Massachusetts, and the spreading of these pests into other states has called the attention of the people, as never before, to the importance of insect prevention, and we hope to be able to keep such pests out of this State by proper and careful methods. This problem is so great in Massachusetts that the amount of \$300,000 was appropriated for fighting these two pests alone, and \$30,000 additional for the study and introduction of parasites. They have now escaped into New Hampshire, Vermont, Maine, Rhode Island, and Connecticut, and are very liable to reach this State. They practically destroy every green

thing, and are so much worse than the San José Scale that there is but little comparison to be drawn between them.

3. Within the Keystone State the San Jose Scale has destroyed hundreds of thousands of dollars worth of trees and shrubs, as well as tens of thousands of dollars worth of fruits, directly, during the past year.

4. To prevent this loss, special provision was made by the Legislature two years ago, and about thirty inspectors and demonstrators have been appointed to work (part of the time during the last fourteen months) under the Division of Zoology of the Department of Agriculture, to ascertain the presence of this destructive pest, and to notify persons whose trees may be infested with it, and who may not know it; also to show them how to control it.

5. The Bulletins of the Division of Zoology have been issued as regularly as possible, bearing almost wholly on insects or their enemies, and have reached at least 50,000 readers each month.

6. The correspondence from the office of the Economic Zoologist has been very great, amounting to at least 500 letters per month; of these at least 75 per cent. are directly upon the subject of insects and other plant pests.

7. The agricultural papers and newspapers of the State are aiding in taking up the warfare against such pests, in disseminating the methods of their control.

8. The more advanced agriculturists and horticulturists are buying and using spraying machinery, and more spraying has been done in this State during the past year than in all previous years combined. Their results are satisfactory, generally, and this encourages them and others to proceed with methods which will save their trees and other plants.

9. The manufacturers of spraying apparatus and commercial insecticides are taking advantage of the needs of the day in sending considerable literature to the farmers and fruit growers over the State, and this aids in calling attention to the importance of insecticidal work.

10. The high price of fruits and the certainty of controlling such pests as the Scale insects have combined to induce persons to plant young orchards, and nurserymen tell us that during the past year they have had unusual sales of fruit trees for starting orchards in this State.

These influences have combined to call the attention of the public to the insect pests and the possibility of controlling them in a satisfactory, effective and cheap manner, and producing first-class fruits even though a few pests be present.

We believe it possible to obtain a fair view of the subject of insects in Pennsylvania during the past year by running through the list of specimens received in the office of the Economic Zoologist. Over 5,000 different collections have been made or received, and all of these have been classified and studied. We find the San José Scale to be, of course, the chief insect sent us, and the one of which most inquiry has been made. In the bulletins of the State Zoologist for February, July, November, and December, of 1906, special attention has been given to the San José Scale and its remedies, and from the experiments there outlined, as well as from written reports from practical fruit growers in many portions of the State,

it is shown that the best and cheapest remedy for this pest is the boiled lime-sulphur wash, which should be boiled at least one hour. These experiments show that the addition of salt has not been necessary, and even some injurious results may come to twigs and buds of peach trees when applied during the fall or winter, with the salt added. Since these bulletins are for free distribution, it is not necessary to dwell at length upon this subject. However, it should be added that the tests of the commercial insecticides have been made with practically the same results that have been obtained in other states, viz: that some of these materials are effective in killing the scale when applied strong enough to have the desired effect, but they should be stronger than claimed by manufacturers and agents, or (for two or three of the leading brands) one part to ten, or at most fifteen parts of water, instead of one to twenty, as claimed by the manufacturers and agents.

To avoid the appearance of personal interest in this regard, we advise each person to try a little of such material for himself, and thus, by practical experience, learn the results on his own trees, but to depend upon the cheaper standard or home-made remedies for saving most of his trees until he is well satisfied that he can control the scale in a satisfactory and inexpensive manner by the use of the so-called miscible oils or soluble oils or other commercial insecticides.

In this connection it should be said that the whale-oil soap, two pounds in one gallon of water, applied as a spray or thorough wash in the spring before the buds burst, will have excellent results in killing all pests on the trees, but will not be found as cheap as the lime-sulphur wash, and the latter is also a germicide and fungicide as well as insecticide. The great objection to the lime-sulphur wash is the trouble with clogging nozzles, which can be overcome by straining through a conical wire strainer set in a funnel, as shown by the funnel here exhibited.

Unfortunately, it appears that the San José Scale is here to stay, and cannot be exterminated, yet it can be controlled, and encouragement should be found in the experience of hundreds of persons whose names and addresses we can give, who are satisfied with the results of their spraying. We believe it very important that a study of the enemies of these pests should be made, and, if possible, to develop or propagate parasites. The attempt will be worth a great deal to the agricultural interests of this State.

To aid in disseminating practical information concerning scale insects, we have prepared some models showing such pests greatly enlarged, in natural colors and forms, which are used in meetings where these subjects are discussed. I exhibit them here:

Oyster-shell Scale.—The Oyster-shell Scale stands next in regard to numbers of specimens sent to the office of the Zoologist and inquiries made. This is quite different from the San José Scale as shown by these models, but it is too often confused with it by persons who know neither. Our experiments have shown that it is killed by early spraying, using the lime-sulphur wash before the buds burst, just as for the San José Scale. Practical results have been obtained in this way for this pest by our experiments, as well as by fruit growers, such as Hon. H. E. Little, Tunkhannock, Pa., and Mr. Van Busick, of Erie county, who reported this to us.

Scurfy Scale.—The Scurfy Scale stands next in the attention given these pests of fruit growers, and is often mistaken for the more serious San José. However, it is easily distinguished according to the specimens shown, and is controlled or exterminated by many of the good remedies for the San José.

Lecanium.—The fourth common scale insect in this State is the Lecanium, also called Soft Scale and Turtle-shell Scale. In some parts of the State it is very destructive to peach and plum, while another species has commonly been reported upon the magnolia and tulip trees.

Among insects which have attracted the attention of the growers of plants, are various kinds of Aphids or plant lice, which have a host of enemies holding them in check, and which are to be destroyed by comparatively mild contact insecticides, such as whale-oil soap, one pound in six gallons of water, or soft soap, or common laundry soap, one pound in about three gallons of water.

The Woolly Aphis belongs to the same family as the Green Aphis and Brown Aphis. It works on the roots of plants as well as on the branches, especially where the bark of either root or branch has been injured. On the roots use tobacco dust abundantly worked in around them, and upon the bark use any of the strong contact insecticides, such as a wash of soap solution made as thick as paint.

Unusual numbers of katydid eggs have been sent to us with the supposition that they were scale insects of some kind. The specimen exhibited was received yesterday, showing the eggs attached to a wire; as a rule they are attached to small twigs of trees or shrub. Please note that practically all of these eggs are punctured with holes of parasites, showing the beneficial effects of parasitic insects in keeping in check what might become a very serious pest.

During the past years we have had an outbreak of the Seventeen-year Locust or Cicada, especially throughout the central part of the State, from Montour and Columbia counties, southwestward through the mountainous country, reaching across into Bedford, Blair and Cambria counties, and including several other counties in that region not here named. A small area of infestation by this pest also occurred in the eastern part of the State, in Berks, Schuylkill, Bucks and Montgomery counties, and possibly some adjacent regions. Of course, their injury was made only by piercing branches to lay their eggs.

The Canker Worm has appeared in great numbers during the past two or three years, from the central to the extreme western portions of this State. However, last year their parasites were sufficiently numerous to control them in some of the extremely western counties, like Beaver and Lawrence, and consequently they did not appear there this year in such destructive numbers. A peculiar feature of this Canker Worm outbreak is, that the pest was really the Fall Canker Worm, but it had the habits of a quite different species, known as the Spring Canker Worm, in ascending the trees and laying its eggs in the spring of the year instead of in the fall. Our experiments show that banding to prevent the female climbing trees can be made effective if properly done and given close attention, but in the hands of many persons the bands were neglected, and as soon as the conditions became favorable, she passed over the bands and laid her eggs, and, unfortunately, banding was con-

demned because of imperfect methods, just as spraying is often condemned for exactly the same reason.

Let me here pause to state that we have made a special study of the causes of failure in spraying, and find that in almost all cases this is due to lack of thorough application to absolutely all parts of the infested trees and from all sides.

It was found possible to control and kill the Canker Worm by spraying with arsenical poisons, such as Paris Green, one pound in a hundred gallons of water, or Arsenate of Lead, about three pounds in a hundred gallons of water, being especially careful to apply all these remedies as soon as the young hatched and commenced to feed. After they become large, they are very difficult to kill.

The Bag Worm is a common pest on fruit and shade trees in the southern portions of this State, and is especially injurious to cedar, arbor vitae, etc., where it often is not observed. It is easily destroyed by picking by hand and burning, or by spraying with arsenites at the proper time. It is interesting to know that we have had specimens of this sent to us with the supposition that it might be the San José Scale.

The Mediterranean Flour Moth has proven exceedingly destructive in mills and other places where it is stored, but has been effectively destroyed by fumigating with Hydrocyanic Acid Gas.

Within the past few weeks there have been unusual reports of grain weevil of various kinds attacking wheat, corn, and other stored grain, but especially wheat. These are to be controlled by fumigation with Carbon Bi-sulphide, in a closed vessel or bin, putting the liquid into a shallow dish, using one pound to one hundred bushels of the grain, and covering it with wet blankets to keep the fumes down. These are heavier than air, and penetrate to the bottom of the bin. We are pushing experiments at this time for detailed information on this very important subject.

The Angumois Grain Moth has proven exceedingly destructive to grain, both in the sheaf and in the bin, especially in the southeastern quarter of this State. It is best destroyed by threshing the grain early, and then fumigating it. Reports have come of great destruction to grain which was threshed late, while other grain in the same field, which was threshed early, was not injured.

The Peach-tree Borer is a pest which has been the subject of our experiments, and we have published how to destroy it without the necessity of cutting, by the application of one quart of boiling hot solution of concentrated lye, one ounce in a gallon of water. Pour a quart of this around the base of each tree during the month of August.

The Chestnut Weevil is the one pest in the way of successful and profitable chestnut production in this State. This becomes very important. The larva and an adult beetle are here shown. We have recently experimented in cold storage for this pest, and we found that chestnuts stored at a temperature of twenty-four degrees were ruined by freezing, but those at thirty-two degrees were in good condition after two months of storage, and all the larvae were killed. It is possible that we may find means of controlling these pests, but scientists have not yet succeeded in this. It must be the subject of further investigation, both by the State and Federal Government,

Finally, parasitic insects must have more attention than they have been given. Efforts have been made to introduce the Preying Mantis into different parts of this State in order that it can result in good by feeding upon insect pests, as it is now doing in the vicinity of Philadelphia, where it has been accidentally but successfully introduced, and is rapidly multiplying. The Lady Beetles deserve attention, and should be studied, preserved and propagated, and if this can be made practical they should be disseminated to infested plants over the State. The same can be said of the thousands of species of internal parasites which are really the chief factors in keeping insect pests in control. Unfortunately, scientists know but little of the real life habits of parasitic insects, and the practical agriculturist knows less. It is a subject of which we should know more, and which should be put upon a practical basis.

In conclusion, let us all co-operate in these important lines of study by sending specimens of insects and reports of incipient insect outbreaks to the State Experiment Station and the State Department of Agriculture, and receive the aid which the State can give from these various sources. More education and advancement is needed in this line, as well as in many others, and we hope to see it pushed successfully for those who need help.

The CHAIRMAN: What action will be taken on this report, or have you any questions?

On motion, duly seconded, it was agreed to receive the report and place it on file.

The CHAIRMAN: Prof. Menges is also to report on this subject. We are ready to listen to him.

PROF. MENGES: I have no report to make; I believe Prof. Surface's paper about covers the question, and as you are pressed for time, I will ask to be excused.

The CHAIRMAN: While we should be glad to hear from Prof. Menges, I suppose we will have to comply with his request, and excuse him. We will, therefore, proceed with the next number on the program, the Report of Committee on Dairy and Dairy Products by R. J. Weld.

This report is as follows:

REPORT OF COMMITTEE ON DAIRYING AND DAIRY PRODUCTS.

BY MR. R. J. WELD, *Chairman.*

At our last annual meeting, Prof. Thos. Shaw stated "that there existed a direct relation between the amount of live stock kept on the farms of the country and a profit that may be derived from those farms." By reason of its geographical position, its large consuming population and its nearness to the great seaboard markets, Pennsylvania is peculiarly situated with reference to one branch of live

stock production, namely, dairy farming. The keeping of cows is universal throughout the State, from the resident of the city or town who keeps one or two cows, to the larger commercial dairies where milk, cream or butter is produced for the market.

While prices of dairy products have ranged even higher this past year than in 1905, much dairy stock has been sold and taken out of the northwestern part of the State. There are two reasons for this: (1) Coarse feeds are short in quantity owing to the mid-summer drouth, and mill feeds are high in price. (2) Help on the farms is scarce and hard to secure. These two conditions make it necessary for the farmer in some sections to reduce his live stock to such proportions as he can handle himself.

The average yield of butter fat per cow per year in Pennsylvania is placed at 160 pounds. Recently I had the privilege of inspecting a herd where the average yield for the past six years has been 260 pounds of butter fat per cow. This difference was brought about by the process of weeding out the unprofitable cows. This process simply calls for the daily weighing of each cow's milk and the monthly testing of that milk by the Babcock test and close attention to feeding and management of the herd. From my own experience I am satisfied that if every farmer would only daily weigh each cow's milk and throw out the lowest producers in his herd, he would reap a benefit sufficient to pay him for his outlay and trouble. With the cost of keeping cows in Pennsylvania at from \$28 to \$32 per year, the margin of profit on some cows is not very large, and we, as business farmers, must apply the common business rule of eliminating the unprofitable elements. Just in this connection, Prof. H. E. Van Norman has been making some investigations in Central Pennsylvania as to the relations existing on some farms between the cost of feed given to the cows and the returns in butter fat. On one farm the farmer was getting ninety-nine cents worth of butter fat for every dollar's worth of feed given to the cows, while on another farm, not two miles distant, the farmer received \$1.79 worth of butter fat for every dollar's worth of feed given. At the college creamery five of the college cows returned as much to their owners as nine of the patrons' cows. These facts only further illustrate the necessity of dairy farmers to pursue their business with strict business-like methods.

In preparing this report, I sent out a list of questions to fourteen members of the Board in different parts of the State. Twelve of these sent replies. Of these twelve, seven report that the keeping of dairy cows is on the increase, while the other five are from the northern and western parts of the State, where dairying has been pushed hard for sometime so that the farms are already well stocked. All report a favorable and profitable season. More than half of the reports state that the dairymen are inclined to take their milk to the creamery or factory. One-half of the reports state that the consumers of butter prefer dairy butter to the creamery product.

To me, the answers to the last two questions, namely: "Are farmers inclined to manufacture their dairy products at home or send the milk to the factory?" and "Does the consumer prefer home-made butter to creamery butter?" point out some needed reforms in dairy husbandry. The dairyman will take his milk to the factory where an honest efficient factoryman is in charge and where all

patrons understand and practice the rules of good wholesome milk production, so that the standard of the goods from the concern will be well up. The consumer of dairy products demands a uniform, wholesome, attractive article which carries with it a guarantee of production under good sanitary conditions.

In some instances the business-like private dairyman has the advantage over the creamery, whose patrons do not appreciate all the responsibility that rests on them. One of the reasons for the average production of our State being so low is the fact that 83 per cent. of the reports sent to me state that either scrub or dual purpose animals are being kept. This condition may be remedied by the use of the pure bred dairy sires. With the exception of Bradford, Centre, Clarion and Potter counties, all the other sections which reported to me state that the shipping of milk to the cities is on the increase. This relieves the butter and cheese markets somewhat and stimulates prices of these two articles. Milking machines are in practical operation in at least two sections, and their workings will be watched with interest by many dairymen.

Legislation is suggested looking to the sanitary oversight of all places where milk is produced, handled or manufactured, also looking to the safeguarding of the operating and accuracy of the Babcock test where it is used to apportion dividends in the purchase of milk, and also for the starting of field instruction or traveling instruction under the direction of the dairy department of the State College by men who will help the butter and cheese makers with their difficulties and the dairymen in improving his conditions and herds.

In closing, it is interesting to note that with the erection of cold storage plants in our smaller cities and boroughs, some dairymen are making a practice of placing their surplus product during the flush season in cold storage, to be taken out later when needed. It seems reasonable to expect the best results from this practice, when only first-class butter, put up in good, tight, well-made packages, is used, and the same placed in cold storage immediately after making. The charges in our section for storage are small, and, so far as I know, the results are satisfactory.

The CHAIRMAN: What shall be done with this report?

Regularly moved and seconded that it be received and placed on file. Agreed to.

The CHAIRMAN: Next comes the Report of the Committee on Feeding Stuffs, by Prof. F. D. Fuller.

Prof. Fuller's paper was as follows:

REPORT OF THE COMMITTEE ON FEEDING STUFFS.

BY PROF. F. D. FULLER, *Chairman.*

The question of the selection of commercial feeding stuffs is one which is occupying the attention of practically every farmer in Pennsylvania at this season of the year. Very few, especially those engaged in dairying, produce all the grain necessary to make a balanced ration for the winter months, and in order to supplement the

home raised food with materials of a highly nitrogenous character, it is necessary to purchase standard articles like cottonseed and linseed meals, brewers' and distillers' grains, gluten meal and feed, wheat bran, middlings and other by-products.

Feeds of this nature will continue to occupy a place in the ration for dairy animals as they have in the past. At the same time, the consumer is beset on every hand with new feeding stuffs—new in name if not in kind. As the result of the close competition between manufacturers and the more complete utilization of by-products, especially those from the manufacture of breakfast foods, we find on the market a large number of cheap articles, goods which have been adulterated or in which low-grade materials have been used in the place of standard articles.

Right here we insert a word of caution in regard to purchasing such materials as "oat feeds," "corn and oat feeds," "mixed feeds," certain kinds of "chop," etc., in which we find a large proportion of light oats and oat hulls.

The feeding value of the above mentioned articles decreases according to the extent of the adulteration with oat hulls, although, as a rule, the retail prices are practically the same as the price of a mixture of corn and oats. Oat hulls contain on the average 30 per cent. of crude fibre, which in most feeding stuffs is of no more value to dairy animals than saw dust. It is, to be sure, broken down to some extent by the animal and yields up a certain amount of its force in the form of heat, but a feed having a high fibre content contains less of the valuable food materials in a more difficultly digestible condition than if the feed contained a small or moderate percentage of fibre.

There are many oat feeds on the market which contain from 25 to 30 per cent. of crude fibre and 6 per cent. of crude protein, which are expensive at almost any price, and we desire to emphasize the fact that as long as the farmer can raise plenty of corn, oats and hay, he cannot afford to purchase any feeding stuffs containing less than 14 per cent. of crude protein.

Protein is a term which includes all the nitrogenous compounds of a feed, regardless of their nature. In everyday life we deal with materials which resemble protein substances, namely, white of egg, casein of milk, lean meat, gelatin, etc., and the animal uses the protein of the food to make these important substances, to restore the waste of tissues and muscles, which occurs at all time, and also uses it to form flesh. Protein is a very necessary ingredient for the farmer to purchase. As protein builds up the animal, so do the carbo-hydrates—sugars, starches and fats—furnish the fuel to keep the animal mechanism in good working condition.

Probably the most popular of all commercial feeding stuffs are the offal from wheat in the manufacture of flour. They consist of particular portions of the wheat kernel and are represented on the market by the bran, middlings, bran and middlings mixed and "red dog" flour. The quality of wheat by-products found on the market at the present time is very good. Samples secured in the open market during 1906 show a high percentage of protein and fat, a state of affairs which did not exist one year ago. The most common adulterant of wheat bran at the present time is probably ground corn cob. This finely ground material is sometimes mixed with bran

and the mixture sold as pure bran, while more often we find it sold as "mixed feed" with some proprietary name attached. Within the past ten days we have analyzed such a mixture, manufactured in a Western state, and retailed in a neighboring city for \$25 per ton. The manufacturers guaranteed the mixture to contain 12.05 per cent. of protein and 3.2 per cent. of fat, and analysis showed that the company guaranteed the material correctly. To the untutored eye, the mixture resembles bran and middlings, and undoubtedly the manufacturers find a ready market, although selling it with low guarantees for protein and fat.

The point which we wish to bring out at this time is that it is important for the consumer to be thoroughly familiar with the average composition of the principal feeds on the market, so that when he sees a mixture which resembles wheat bran and middlings, for instance, guaranteed to contain only three-quarters of the amount of protein that a mixture of pure bran and middlings should contain, he will readily look upon such a feed as suspicious. I am sure no one present can afford to buy a mixture of wheat bran and corn cob, especially at \$25 per ton. We were of the opinion that our feeding stuffs law, which has been so effective in correcting many evils regarding the manufacture and sale of commercial feeding stuffs, should be so amended that it will be a misdemeanor to sell a mixture of wheat bran and corn cob as "mixed feed," or, to put it concisely, the dealer "should state what he sells and sell what he states." We believe that the feed situation in the Commonwealth would be much improved and the dairymen, especially, greatly benefited if our law required that the component parts of a mixed feed should be plainly stamped on the outside of the package in which it is sold, or if sold in bulk or in sacks belonging to the purchaser, a similar statement should be furnished upon his request.

There seems to be much difficulty in maintaining the guarantees for certain feeds composed of molasses and various by-products, but the manufacturer should know the analysis of his finished product, and knowing this, he can place a proper guarantee upon it. Until a feed is manufactured which contains the guaranteed percentage of valuable food ingredients, farmers and dairymen in particular cannot put the confidence in many of the feeds on the market to which they should be entitled. Molasses feeds are palatable and nutritious and good results are apparently secured in using them.

Within the past year many new feeds, composed largely of alfalfa meal, have found their way into our State. We believe that it is poor economy for the farmer to pay a large price not only for the alfalfa, but for having it ground for him when the same material can be produced on the farm at much less expense. Since wheat bran is somewhat more valuable than alfalfa hay, ton for ton, we cannot recommend these feeds at the prevailing prices.

Time will not allow us to touch upon the standard goods, such as cottonseed meal, linseed meal, distillery and brewery by-products, except to say that these articles can usually be depended upon. They are seldom adulterated, the guarantees are usually maintained and they furnish the necessary protein for the least expenditure of money.

There is a class of articles on the market concerning which much

could be said that is not especially complimentary. I refer to the so-called "condimental" and "medicinal" stock foods, the principal ingredient of which is cottonseed or linseed meal, wheat offal or other common feeding stuff, to which is added such articles as charcoal, sulphur, ginger, Epsom and Glauber's salts, Venetian red, gentian, anise, fenugreek, etc., apparently for medicinal effect. I wish to repeat what I have already published in regard to these goods that such mixtures are worth about \$30 per ton for food purposes and the retail prices vary from \$70 to \$500 or over per ton. Suffice it to say that under no circumstances can the farmer afford to buy such foods at the prices asked. A well animal does not need them, and if it is sick the services of a veterinarian should be secured rather than depend upon the drugs supplied by condimental stock foods. It remains for the farmers and breeders of Pennsylvania to say that they will not be deceived and robbed by these condimental preparations. If domestic animals need a tonic one can be prepared for a few cents which will answer the purpose. The only way to clear the market of such articles is to create a sentiment against them and your influence can be felt all over the State. As long as there is a demand for them, just so long will the supply be maintained, for there is enormous profit in their sale.

The State feeding stuffs law requires that practically all feeds must be guaranteed to contain certain percentages of protein and fat and we advise the farmer to purchase only guaranteed articles. Examine carefully whatever you buy and if there is any doubt in your mind as to its value, do not purchase. Although we have in this brief report touched some of the poor goods offered for sale, we are glad to report that there are on the market a large variety of feeding stuffs of good quality from which the farmer should have no difficulty in selecting those best suited to his need, remembering to purchase only high grade goods to supplement the crops grown on the farm.

It gives us great pleasure to say that owing to the rigid enforcement of the feeding stuffs law by the Department of Agriculture, goods are being more generally guaranteed, high guarantees are being lowered to conform to actual analysis and many spurious feeds are being driven from the market, thereby placing it in good condition and saving thousands of dollars to the farmers of the Commonwealth.

Mr. Herr having temporarily left the room, Mr. Chubbuck took the Chair for the remaining part of the afternoon session.

The CHAIRMAN: What is your pleasure, gentlemen, in regard to this report?

On motion, duly seconded, it was agreed to receive this report and place it on file.

MR. SCHWARZ: I move that the discussion of the foregoing reports be postponed for a while until we hear Prof. Hopkins' paper.

Seconded and agreed to.

The CHAIRMAN: We shall now have the pleasure of listening to Prof. Hopkins, of the Illinois State University.

Prof. Hopkins then read his report, as follows:

LAND RUIN COMPARED WITH SOIL IMPROVEMENT.

BY PROF. CYRIL G. HOPKINS, *University of Illinois, Urbana, Ill.*

To permanently maintain profitable systems of agriculture is the most important material problem of the United States, not only because agriculture must be self-supporting, but because every other important industry in America depends upon agriculture for support. Every form of agriculture rests, first of all, upon the fertility of the soil, whether it be grain farming, fruit growing, market gardening or live stock husbandry.

In our present prosperity and abundance we almost forget the latest famine in Russia; can scarcely realize that much of the time more people are hungry in India than live in the United States; and will not remember tomorrow President's call of today for help to relieve the widespread famine now existing in China. Meanwhile we go on, as a people, ignorantly, carelessly or wantonly robbing the soil of its fertility and American posterity and our children of a rightful heritage.

Among all the nations of the earth the United States stands first in the rapidity of soil exhaustion. The improvement of seed, the use of tile drainage, the invention and immediate adoption of labor saving agricultural machinery, the wonderful development of cheap and rapid means of transportation, and the opening of the world's markets to the American farmer have all combined to make possible and to encourage the rapid depletion of American soils, until practical agricultural ruin already exists over vast areas in the older parts of this new country—the United States of America; while it is common knowledge even in new rich states of the Central West that the lands that have been under cultivation for half or three-quarters of a century are much less productive now than they once were.

The almost universal practice of the civilized world to this date has been to ruin land and then to seek out newer lands on which to repeat the process even more quickly.

What have been the common systems of land ruin? First, beginning with the virgin soil, we crop continuously with corn and small grains till the reduced yields render the system unprofitable. Next we introduce clover into the rotation and thus secure from the air not sufficient nitrogen to meet the needs of the crops grown in the rotation, but only sufficient to supplement what can still be taken from the soil by succeeding crops.

But the fixation of nitrogen is not the only function of clover, nor indeed its most effective function on many soils. Clover is a gross feeder on phosphorus and potassium, and on soils deficient in one or both of these elements clover serves as a most powerful element to deplete the soil of mineral plant food, not only by removing what it needs for its own growth, but also by its powers, as its residues decay, to liberate additional amounts of mineral plant food

for the use of succeeding crops of grain or grass. This practice may be continued until the clover system fails, clover itself, used as a soil stimulant, being the first crop to fail. Clover failure may result from several different causes. If grown too frequently, on the land, it is quite probable that clover sickness may develop, although it still remains to be proven whether clover sickness is a fact. On some lands clover may fail because of the development of soil acidity; but the most common cause of clover failure that I have noted on land that has grown clover well in former years is the lack of sufficient mineral plant food in available form.

After the failure of the clover system of grain farming, we may make use of still more powerful soil stimulants, as land-plaster, or heavy applications of caustic lime, not applied merely in sufficient amount for what we might call the legitimate purpose of correcting soil acidity, but rather for the purpose of forcing the soil to give up larger amounts of plant food than it would otherwise furnish.

After this system fails, we next turn to the ordinary complete commercial fertilizer system, in which we apply not sufficient plant food to meet the needs of the crops grown, but only enough to supplement that which can still be forced from the soil. Of course the effect of this system is to make the land poorer and poorer until the soil furnishes so little and so much fertilizer is required for the moderate or meager crops produced that the business becomes unprofitable and not infrequently the land is then abandoned for agricultural purposes.

Shall we call this soil exhausted? No, it is not exhausted. No soils ever become exhausted, not absolutely devoid of plant food, and no soils ever become so completely ruined that they cannot be restored by some system of improvement. Just what system should be adopted will depend largely upon the character of the soil. If nitrogen is the only element whose total supply is so greatly depleted as to render the land unprofitable for cropping, and if the organic matter in which the nitrogen was stored has become so reduced that the mineral matter is not made available in sufficient amounts for profitable crops even though the total supply in the soil may be large, then the productive capacity of the land can be restored by storing the soil with decaying organic matter rich in nitrogen. This is most likely to be the condition on sloping hill land whose subsoil is rich in mineral plant food and whose surface soil is washed away at least as rapidly as the plant food is removed by the crops.

If, however, the total supply of phosphorus has become so deficient that sufficient amounts cannot be liberated to meet the needs of maximum profitable crops, which is likely to be the case with many upland soils of level, or nearly level, topography, then that element should be restored in liberal amounts in order to bring back the power of the soil to grow clover as well as other crops. If both phosphorus and nitrogen are deficient, then phosphorus and nitrogen should be returned. And if potassium is so lacking in the soil that liberal supplies of decaying organic matter cannot liberate sufficient potassium for large crops, a condition sometimes though rarely found, then certainly potassium should be supplied.

You may ask: How is one to know about the total supply of nitrogen and of phosphorus and of potassium contained in the various soils of the State? What soils are acid, and how acid; and what are

the peculiar difficulties with some peculiar soils? I cannot answer these questions better than by saying that the people of Illinois have made it the duty of their Agricultural Experiment Station to make a complete survey of the soils of the state, including not only the mapping in practical detail of all the soils found, but also the analysis of representative samples from every type of soil, supported by actual field experiments on all important types, so that when the work is completed every farmer may know the type or types of soil on his farm, and the average composition of each type of soil, and also the results obtained from different systems of soil treatment. The total expense of doing this work for the whole state, including the operation of soil experiment fields for many years on the most important soils in every section of the state—the total expense for this work will probably be no greater than the cost to Illinois of exhibiting her products at the Chicago and St. Louis exhibitions.

I accepted an invitation to speak to Pennsylvania farmers with the definite understanding on the part of your officers that I am not qualified to discuss Pennsylvania soils; but I am to try to discuss the materials and the methods to be used in soil improvement.

Farm manure has always been, and without doubt always will be, the principal material used in maintaining the fertility of the soil; but it is an unquestionable fact that the greatest source of loss to American agriculture today is in the enormous waste of farm manure.

If corn were worth \$1.05 a bushel, then the average annual value of the corn crop in the United States for the past ten years, including 1906, would be equal to the average value of the total farm manure annually produced in this country. This statement is based upon the careful estimates of the United States Department of Agriculture, placing the average annual corn crop at nearly two and a quarter billion bushels, and the average value of the manure annually produced by twenty million horses and mules, sixty-one million cattle, forty-seven million hogs, and fifty-two million sheep at more than two and one-third billion dollars.

The evidence is sufficient to fully justify the conclusion, and practical observing farmers will agree, that at least one-third of the manure produced is wasted on the average American farm. If this is true, then the total value per annum of all commercial fertilizers used in the United States (amounting to about seventy-five million dollars) is equal to only one-tenth of the annual waste of farm manure. This is no argument against the intelligent and profitable use of commercial plant food by those who make and save and use farm manure to the greatest practicable extent, but it serves only to emphasize the tremendous loss to the country from the waste that is permitted.

The value of farm manure can be, and has been, determined by two entirely different methods.

First, the manure may be analyzed chemically to ascertain the kinds and amounts of plant food it contains, and its value then computed from the cost of the same amounts of these plant food elements if purchased in the world's markets in commercial form.

Second, the manure may be applied to the land in a series of soil experiments where a suitable crop rotation is practicable, and its

value determined by computing from the value of the increase which it produces in the different crops.

The plant food in a ton of manure varies greatly with the materials used for feed and bedding. Thus, wheat straw contains per ton about ten pounds of nitrogen, two pounds of phosphorus and seventeen pounds of potassium; while clover hay contains about forty pounds of nitrogen, five pounds of phosphorus and thirty pounds of potassium. At fifteen cents a pound for nitrogen, twelve cents for phosphorus and six cents for potassium, the value of these elements is \$2.76 a ton of wheat straw, \$5.40 in timothy hay, \$8.40 in clover hay and \$9.42 in a ton of alfalfa hay.

The following facts may well be kept in mind:

1. In grain crops about two-thirds of the nitrogen, three-fourths of the phosphorus and one-fourth of the potassium required for the crop will be contained in the grain, while about one-third of the nitrogen, one-fourth of the phosphorus and three-fourths of the potassium required for the crop will be found in the straw or stalks.

2. In nitrogen and phosphorus, clover and other legume crops are about as rich as grains, nearly twice as rich as timothy or red top and more than twice as rich as straw or stalks.

3. When crops are fed to live stock about three-fourths of the nitrogen, three-fourths of the phosphorus and practically all of the potassium contained in the feed will be returned in the solid and liquid manure, the animals retaining only about one-fourth of the nitrogen and one-fourth of the phosphorus, as a general average.

From these facts it becomes very plain that the quality or richness of manure must depend very largely upon the kind of feed used.

The value of a given supply of manure varies greatly with the exposure it suffers under weather conditions.

If ordinary fresh farm manure contains ten pounds of nitrogen, two pounds of phosphorus and ten pounds of potassium per ton of manure with a dry matter basis of 25 per cent. (and 75 per cent. water), the manure that will result from holding such fresh manure until it becomes more or less rotted will vary greatly in composition, depending upon the conditions to which it is subjected.

If the fresh manure is exposed for a few weeks to the leaching of heavy rains, half of the nitrogen and potassium may be leached out, while smaller losses of phosphorus and dry matter occur, so that a full ton of the resulting manure, in which the urine (which usually contains about half the nitrogen and potassium) has been replaced by rain water, may contain only six pounds of nitrogen, two pounds of phosphorus and six pounds of potassium. This difference of four pounds each of nitrogen and potassium does not represent the total loss, because if the pile contained ten tons of fresh manure there will be left perhaps only eight tons of the leached manure, even with the same percentages of dry matter and water.

If, however, the pile of manure suffers less from leaching but more from fermentation and heating for several months, the loss of dry matter and nitrogen will be great, while the loss of phosphorus and potassium will be less. Rotted manure produced in this way is usually richer per ton than fresh manure, but the total amount of manure has been so reduced that the loss is very great.

These simple principles should be kept in mind:

1. In leaching fresh manure there are great losses of nitrogen and potassium and moderate losses of phosphorus and organic matter, the materials lost being carried away in the leach water.

2. In fermentation and heating there are great losses of nitrogen and organic matter in volatile products which escape into the air, but if no leaching occurs there is no loss of phosphorus or potassium.

In an exact experiment conducted at Cornell University, 4,000 pounds of ordinary manure from the horse stable, worth \$2.74 per ton for the plant food it contained, were exposed in a pile out of doors from April 25 to September 22 (about five months), but at the end of that time the total weight decreased from 4,000 to 1,730 pounds, and that was worth only \$2.34 instead of \$2.74 per ton. In other words, the value of this pile of manure was reduced from \$5.48 to \$2.03 during the five months exposure. In another experiment manure exposed for six months lost 56 per cent. of its dry matter and 43 per cent. of its plant food value. In this case the fresh manure was worth \$2.27 a ton, while the rotted manure was worth \$3.01 a ton, but the loss in total weight and plant food was such that for each ton originally worth \$2.27 there remained only \$1.30 worth after six months' exposure.

The plant food in a ton of manure varies somewhat with the kind of live stock. Thus, young, growing animals and animals giving milk will retain a larger proportion of the nitrogen and phosphorus than fattening stock, work horses or other mature animals. On the other hand, it is well understood that the difference in value commonly recognized and most frequently considered, as, for example, between sheep manure and horse manure, are due almost entirely to the difference in water content. As a matter of fact, manure from work horses or from fattening steers fed on clover hay and heavy grain rations is fully as rich as sheep manure if both are reduced to the same percentage of dry matter. Of course, sheep manure containing only 60 per cent. of water, is twice as rich as cattle manure containing 80 per cent. of water.

Average fresh cattle or horse manure, made from clover and timothy hay and some grain, with sufficient straw bedding to absorb and retain the liquid manure, will contain per ton of manure about ten pounds of nitrogen, two pounds of phosphorus and ten pounds of potassium, on the basis of 25 per cent. of dry matter. Computed at the present market values for these elements—15 cents a pound for nitrogen, 12 cents for phosphorus and 6 cents for potassium—such manure would be valued at \$2.34 a ton.

Some will argue that the plant food in farm manure is not so readily available and consequently should not be valued so highly as that in commercial form, but experiments show that when a series of years is considered the farm manure may be worth about as much as the commercial materials on the basis of plant food content. Thus, at the Rothamsted Experiment Station, an application of 14 tons of farm manure, furnishing, according to the above averages, about 140 pounds of nitrogen, 28 pounds of phosphorus and 140 pounds of potassium, per acre per annum, has maintained the yield of wheat at 35.6 bushels per acre, as an average of fifty years; while an average yield of 36.9 has been maintained during the same years by an application of commercial plant food furnishing 129 pounds of

nitrogen, 27 pounds of phosphorus and 84 pounds of potassium per acre per annum.

If we disregard potassium (which is not very important because of the richness of Rothamsted soil in that element) the amounts of plant food applied and the average yields produced during half a century are not markedly different. The yield of the fertilized plot averages 1.3 bushels higher during the fifty years, but .7 bushel lower during the last ten years than the manured plot.

It is a very common and very erroneous belief that crop rotation possesses about the same value as the application of farm manure.

The great difference between these two processes is that crop rotation is a stimulant and ultimately reduces the fertility of the soil to such a degree that the crops fail, especially the crops that have the most stimulating effect, as clover; whereas, in application of farm manure there is a positive addition to the soil of the materials of which crops are made, so that with sufficient manure the soil may be made richer and richer for an indefinite length of time.

The only element of plant food that can be added to the soil by crop rotation is nitrogen, which can be secured from the air by clover and other legume crops.

It should be understood, however, that on many soils the marked effect produced by clover, by which increased yields of succeeding crops are secured, is not due largely or primarily to the addition of nitrogen, but rather to the power of clover to liberate mineral plant food from the soil for the use of following crops.

This process may be continued successfully until the supply of phosphorus (or of potassium in some cases) becomes so reduced that even the strong feeding clover plant cannot secure enough phosphorus for its own growth. When this condition arrives the clover crop begins to fail, and the only resource is to begin to return the exhausted plant food. Phosphorus may be returned in bone meal, in rock phosphate or in sufficient amounts of farm manure. Indeed, the most beneficial effect of farm manure is often seen when it is applied for the clover crop. This fact alone, which is a common observation, is sufficient to show that farm manure has a value not possessed by clover or by crop rotations.

We should not discourage the rotation of crops, because in almost any system rotation helps us to grow large crops, and to be successful in farming requires that large crops shall be grown even though correspondingly large amounts of plant food are removed from the soil.

It is certainly good farm practice, and usually the best farm practice, to remove the largest quantities of plant food from the soil, for the simple reason that large crops require large quantities of plant food; but it is no less important to restore to the soil, when needed, as large or larger quantities of plant food than are removed—by turning under legume catch crops and residues not removed from the field, by returning manures produced on the farm, and so by the purchase of commercial plant food, such as phosphorus in bone meal or rock phosphate, or potassium in concentrated potassium salts. Thus the most important process in all farming operations is the circulation of plant food, without which the fertility of most cropped soils cannot be permanently maintained.

Let us consider in further detail the effect of crop rotation on soil

fertility. Suppose we are practicing a four-year rotation, including corn for two years, oats with clover seeding the third year, and clover for hay and seed crops the fourth year. Let us assume such crop yields as have been produced, and as can be produced, in normal seasons on the richest, best-treated land with good seed and good farming namely, 100 bushels of corn per acre, 100 bushels of oats, and 4 tons per acre of clover including, perhaps, 3 tons in the hay crop and one ton in the seed crop. If we do not succeed in securing these yields we should at least try to make such yields possible and we should approach as near to them as we can.

Let us first consider the phosphorus required for this rotation. The two crops of corn will each require 23 pounds, 17 for the grain and 6 for the stalks; the oat crop will require at least 15 pounds of phosphorus, about 11 for the grain and 4 for the straw; and the 4-ton crop of clover will require 20 pounds of phosphorus. Thus we see that 81 pounds of the element phosphorus will be required for the rotation. If we leave the stalks on the land the requirement is reduced to 69 pounds of phosphorus or to about 17 pounds a year per acre.

Suppose the soil contains in the first seven inches 1,200 pounds of phosphorus per acre, which is about the average of the principal type of soil in the Illinois corn belt; how many years would be required to remove this amount from the land if it could be drawn upon at this rate? Only 70 years. On the other hand, suppose with this crop rotation we can secure from the soil the equivalent of only 1 per cent. of the phosphorus contained in the first seven inches. This would be only 12 pounds of phosphorus a year, which would necessarily reduce the crop yields to about one-half the amounts suggested above, and with the further reduction in the total amount of phosphorus year by year, the crop yields must be reduced accordingly.

On the ordinary soils of Illinois ultimate failure is the only future for this system of farming, even if we consider the phosphorus alone, although, as stated above, the phosphorus may be returned in bone meal, in rock phosphate or in sufficient amounts of farm manure.

If we consider the element nitrogen in this system of farming we find that 200 bushels of corn require about 200 pounds of nitrogen, aside from that required for the stalks, and the stalks must be returned to the land without burning, otherwise the 96 pounds of nitrogen required for the two crops of stalks will also be removed from the land. The oats crop will remove 90 pounds of nitrogen, making 290 pounds per acre for the corn and oats.

The 4 tons of clover will contain about 160 pounds of nitrogen and the clover roots and stubble about one-half as much as the tops, or 80 pounds per acre. If all of the nitrogen contained in the entire clover crop is taken from the air, the rotation would add only 80 pounds of nitrogen to the soil, while the corn and oats would remove 290 pounds.

How, then, is it possible to maintain the supply of nitrogen by this rotation? It is not possible. Under such rotation, with all crops removed except the corn stalks, the supply of nitrogen grows less and less. Where this rotation is successful for a time it is due to the fact that the soil nitrogen has been drawn upon year by year

while the chief effect of the clover has been to extract phosphorus from the soil for its own growth and for the use of succeeding crops.

There is another point to be considered in reference to nitrogen. On land that is capable of furnishing sufficient nitrogen for even a 50-bushel crop of corn, the clover crop will undoubtedly draw a third of its nitrogen from the soil and not more than two-thirds from the air. Consequently, since two-thirds of the nitrogen in the entire plant is removed in the tops, the roots and stubble will leave no more nitrogen in the soil than the plant takes from the soil. How, then, can we maintain the supply of nitrogen in the soil? By plowing under sufficient clover or by applying sufficient farm manure, or better, by both of these means.

If all the crops grown in rotation are fed, including the corn stalks, containing a total of 526 pounds of nitrogen from four acres, and if three-fourths of this, or 395 pounds, are returned in the manure, we have sufficient to replace the 386 pounds removed in the corn and oat crops and we may assume that the 160 pounds removed by the clover came from the air. Of course some additional nitrogen will be saved in the straw and stalks which are used directly for bedding, and not for feed.

How shall the grain farmer maintain the nitrogen in his soil? Possibly this can be done by growing an additional legume catch crop in the corn and plowing under everything produced except the grains and the clover seed, preferably only one corn crop being grown in the rotation.

The problem of maintaining the nitrogen becomes easier if we extend the rotation to include about two years of pasture, using a mixture of red clover, alsike, timothy and red top instead of seeding red clover only with the oats. In this case three grain crops, as corn, oats and wheat, or corn two years and oats one year, could be grown during the six-year rotation, the land being kept in meadow or pasture one-half the time.

It is one thing to say that farm manure has a value, but quite another thing to say what that value is or to what it is due.

The positive or intrinsic value of farm manure lies in the amounts of valuable plant food which it contains. It also possesses an important indirect value as a soil stimulant, due to its power as it ferments and decays, in contact with the soil, to liberate from the soil plant food that would not otherwise become available so quickly. There is still another distinct value in farm manure due to the fact that it makes the soil more porous and spongy and thus increases the power of the soil to absorb and retain moisture and to resist surface washing. In other words, this third value of farm manure is due to improvement in physical condition.

The value of farm manure for its physical improvement of the soil is commonly fully appreciated and frequently even overestimated by popular agricultural writers, while its value for plant food which it supplies and that which it liberates from the soil is sometimes almost ignored.

There is no good excuse for erroneous teaching regarding these different values, because there exists a vast amount of positive information both from practical experience and from exact scientific investigations.

Thus, organic matter from peat beds hauled out and spread on the land and incorporated with the soil produces no such effects on crop

yields as are produced by farm manure. Why? Because the peat does not decay readily so as to furnish plant food either by its own decomposition or by liberating it from the soil; and yet the peat has as great power as farm manure for physical improvement of the soil.

Manure made from clover hay and heavy grain rations has much greater value than manure made from wheat straw. Why? Is it because they affect the physical condition of the soil in different ways? No. The great difference in value is due to the difference in plant food and in rapidity of decay.

At the famous agricultural experiment station at Rothamsted, England, on a field to which no manure and no plant food have been applied, the average yield of wheat has been 13.1 bushels per acre for more than half a century. Land treated with a heavy annual application of farm manure has produced 35.7 bushels of wheat per acre as an average of 51 years. Another field treated with commercial plant food without organic matter has produced 37.1 bushels of wheat per acre as an average during the same time. The latter field received a little less plant food than was furnished in the manure, thus furnishing ample proof of the value of plant food supplied in manure and showing that the physical effect of the farm manure was by no means so important.

Nevertheless the physical effect should not be overlooked. Under certain seasonal conditions this physical effect may be very important. Thus in the very dry season of 1893 the land fertilized with commercial plant food produced only 21.7 bushels of wheat per acre, while the farm manure plot produced 34.2 bushels the same year.

In semi-arid regions the physical conditions of the soil and its power to absorb and retain moisture may be the controlling factor in crop yields, but where the average annual rainfall is 28.21 inches as at Rothamsted) or 37.39 inches (as in Illinois) with a fairly uniform distribution during the growing season, the physical condition of the soil in relation to crop yields may be compared to the shelter and other physical surroundings provided for live stock. In other words, under normal conditions the controlling factor is food, for crops as well as for live stock.

While manure has some value for physical improvement and a larger value of its power to liberate plant food from the soil, it should be clearly understood and always borne in mind that the great value of farm manure, especially in profitable systems of permanent agriculture, is due to the plant food it contains and that the greatest problem in the handling of farm manure is to prevent the loss of plant food.

The value of the average fresh farm manure is about \$2.25 a ton either when determined by chemical analysis on the basis of market values for the plant food contained in the manure, or when determined by the value of the increased crop yields produced when the manure is applied to the fields in ordinary crop rotations.

This means that a pile of average fresh farm manure containing 700 tons is worth \$225. If exposed to leaching from heavy rains during only two or three months in the spring the value will be reduced as a rule from \$225 to about \$150 by the loss of plant food without much reduction in total weight. Indeed, the total weight is frequently increased under such conditions, because the rain

water that remains in the manure may be in greater amount than the urine that has been washed out. Fermentation and additional leaching during the summer may easily reduce the value to \$100 or less.

There are two satisfactory methods for handling manure. One of these is to haul and spread the fresh manure daily, or at least two or three times a week. For this work a manure spreader or at least a wagon used for this work only, is very useful and almost necessary.

The other method is to allow the manure to accumulate in the stall or covered feeding shed while it is constantly tramped by the animals and kept moist by the liquid excrement, sufficient bedding being used to absorb the excess and to keep the stock clean, and then to haul and spread it on the land when conditions permit. It should not be left, however, to dry out and heat and decompose in the stalls or sheds long after the animals have been turned out to pasture.

Every system of farming should be so planned as to be both profitable and permanent, which requires that the productive capacity of the land be maintained. We must understand, then, what the soil contains, what materials are required to produce crops, in which parts of the crops these different materials are deposited, so as to know what part of the produce may be sold and what part should be retained on the farm; also what is done with these important plant food materials when the crops are fed to live stock.

The older prairie and upland timber soils of the states of the Central West are exceedingly rich in potassium, but relatively deficient in both nitrogen and phosphorus. In the worn hill lands nitrogen is usually more deficient than phosphorus, while in the average long cultivated prairie soil phosphorus is more deficient than nitrogen.

When grain crops are produced, as corn, oats and wheat, about two-thirds of the nitrogen and three-fourths of the phosphorus, but only one-fourth of the potassium required for the crop are stored in the grain or seed; while about one-third of the nitrogen, one-fourth of the phosphorus and three-fourths of the potassium are stored in the straw or stalks.

Thus a large crop of corn (100 bushels to the acre) will contain about 100 pounds of nitrogen in the grain and 48 pounds in the stalks; 17 pounds of phosphorus in the grain and 6 in the stalks; 19 pounds of potassium in the grain and 52 in the stalks. Quite similar relations exist between the grain and straw of other crops.

Now, with these facts in mind it is plain to see that a system of farming in which the grain is sold and only the stalks and straw are kept on the farm and returned to the soil carries off in the grain much of the nitrogen and phosphorus, in both of which these soils are more or less deficient, and which should be returned to the land; while the potassium, of which the soil contains an inexhaustible supply, enough in the first seven inches for 100 bushels of corn per acre every year for seventeen centuries, is largely returned in the straw and stalks.

It should be remembered that legume crops, as clover, cowpeas and soy beans, are rich in both nitrogen and phosphorus, three and one-half tons of clover hay containing as much phosphorus and 40 pounds more nitrogen than 100 bushels of corn.

If the crops are fed to live stock it is well to know about one-fourth of the nitrogen and one-fourth of the phosphorus are retained in the flesh and bone of the animal, while three-fourths of the nitrogen and phosphorus and practically all of the potassium are returned in the solid and liquid manure.

Thus we have another process of separation by which part of the needed nitrogen and phosphorus leaves the farm with the animals, while the potassium is again returned, even though it may not be needed.

It should be a plain fact that manure made from animal excrements with straw or stalks for bedding must be deficient in nitrogen and still more deficient in phosphorus, but rich in potassium, as compared with the requirements of the crop; and this is especially noteworthy when the manure is to be used on land already deficient in nitrogen and phosphorus but well supplied with potassium.

In the case of nitrogen the difficulty can be overcome by making a liberal use of clover or other legumes in the crop rotation and as catch crops, turning under these crops and crop residues so far as practicable. Legume crops may also be used in pastures to a considerable extent, thus receiving nitrogen from the air to balance the deficiency in the manure.

With the phosphorus the difficulty is greater, because the proportion contained in the manure is less and there is no such ever-present inexhaustible supply as in the case of nitrogen.

It must be apparent that to increase the value of farm manure we should add phosphorus to it. Thus we can balance manure and when added on soils rich in potassium in rotation with nitrogen-fixing legume crops we can provide plant food in a balanced ration to meet the needs of the maximum crop yields. By these means we can check the progress of soil exhaustion and even gradually increase the fertility and productive capacity of the land. Indeed, we can thus profitably enrich such land even beyond its virgin fertility.

By far the cheapest form of phosphorus is the fine-ground raw rock phosphate. This material is but slightly available for the use of crops if applied to soils deficient in decaying organic matter; but, if applied in intimate connection with rotting manure, it is thus made soluble and available for plant growth.

Certainly one of the most profitable and probably the very most profitable methods of maintaining the necessary supply of phosphorus in the soil is to put back into the manure in the form of fine-ground raw rock phosphate somewhat larger amounts of phosphorus than the animal has retained in his bones. It is well for a time, at least, to put back larger amounts than the animal retain, because the soils are already deficient in phosphorus and also because there may be some waste of manure.

These statements are based both upon the chemical analysis of soils and crops and manures and also upon carefully conducted field experiments covering many years.

The Maryland Experiment Station furnishes some valuable data from probably the earliest systematic investigations still being continued, and a large amount of information is rapidly accumulating from our more extensive work in Illinois; but the most complete experiments of long duration are reported by the Ohio Experiment Station. Where 40 pounds of fine-ground rock phosphate, costing

about 16 cents, were added to each ton of manure and 8 tons of manure per acre were applied for a three-year rotation of corn, wheat and clover, the value of the increase in crop yields was equal to \$2.66 for each ton of manure used, in case of yard manure (which was worth only \$1.64 per ton without the phosphate), and, in case of the stall manure, its value was increased from \$2.22 a ton to \$3.42 by the addition of the 16 cents' worth of rock phosphate, these results being the average of nine years' experiments on three different series of plots, based upon increased yields valued at 35 cents a bushel for corn, 70 cents for wheat and \$6 a ton for clover hay.

If we deduct the cost of the phosphate used, we still have what might be termed a net value of \$2.50 for the phosphated yard manure, and \$3.24 a ton for the phosphated stall manure.

Of course it would be equally appropriate, and possibly more so, to speak of "manured phosphate," instead of "phosphated manure," because the rock phosphate actually furnishes the needed deficient element, phosphorus, while the manure helps to make it available. On this basis we may say that the value of 40 pounds of rock phosphate is increased from 16 cents to \$1.02 by mixing it with a ton of yard manure and from 16 cents to \$1.20 by mixing it with a ton of stall manure, after deducting the value of the untreated manure in each case.

The most important fact to keep in mind, however, is that both the manure and rock phosphate are much more valuable when used together than when used separately, because manure is deficient in phosphorus and rock phosphate does not act except in connection with rotting organic matter. As a rule it is better to use sufficient rock phosphate with each ton of manure so as to supply about 200 pounds of rock phosphate per acre for each year in crop rotation (a good grade of raw rock phosphate contains at least 12½ per cent. of the actual element, phosphorus, which is equivalent to 28 per cent. of so-called "phosphoric acid").

There are two very satisfactory methods of mixing the rock phosphate with manure. One is to sprinkle the phosphate over the manure from day to day as it is being made in the stall or covered shed. The other method is to fill the spreader part full of manure, then sprinkle phosphate over it sufficient for the load, finish loading with manure and drive to the field and spread. This produces an intimate mixture and a very uniform distribution, and repairs practically no extra work to get the phosphate on the land. Care should be taken that the manure is not too dry when the phosphate is sprinkled over the load, otherwise the dry rock dust may get into the gearing or bearings of the spreader and cause them to wear rapidly.

There are some extraordinary or abnormal soils. Thus, there are soils exceedingly rich in nitrogen and well supplied with phosphorus but very deficient in potassium; as, for example, certain peaty swamp soils on which the application of potassium induces an increase in the corn crop usually amounting to more than 30 bushels per acre, and on which Illinois farmers are already using about \$20,000 worth of concentrated potassium salts annually, and with a net profit of more than 200 per cent.

There are soils exceedingly rich in phosphorus and well supplied

with potassium, but deficient only in the element of nitrogen, and which require only a liberal use of legume crops to be turned under as green manures or returned to the soil as stable manure in order to render them highly productive and profitable soils. Abnormal soils of this class exist in considerable areas in the geologic neighborhood of phosphate regions, as in certain sections of Tennessee and Southern Kentucky. Some of these soils contain twenty times as much phosphorus as the average Illinois corn belt soil.

But, when we consider the ordinary, normal upland timber and prairie soils, covering the vast areas of the Central West, the so-called "granary of the world," extending at least from Ohio to Missouri—soils of the glacial and loessial formation and of granite origin—there are two substances always to be kept in mind and always to be provided in abundance for any and every system of permanent agriculture to be practiced on these soils. These two essential substances are phosphorus and decaying organic matter, which will, of course, also supply the nitrogen.

It is not of so great consequence by what methods or in what forms these materials are supplied.

Phosphorus may be purchased in grain, or in other concentrated foodstuffs, to be fed with clover hay, it may be, and then applied in the form of farm manure, or phosphorus may be applied in the form of bone meal, which is also a farm product, or it may be obtained from the great phosphate mines of our Southern states, as we obtain coal from our extensive mineral deposits in the Northern states.

The decaying organic matter may be supplied in farm manure, or in sufficient quantities of legume crops, not harvested and removed from the land, but turned under as green manures, including the use of rotation pasturages, or still better and more easily and usually more profitably, by a combination of these methods.

But there can be no permanent agriculture for these soils by any system under which the phosphorus is removed and sold in grain and bone in larger amounts than are returned to the soil, nor under any system by which the organic matter of the soil is worn out or destroyed more rapidly than it is replaced.

On the other hand, systems of permanent agriculture for those soils are not only possible, but they are more profitable than any system under which the soil grows less productive.

The CHAIRMAN: What action shall be taken on this paper?

On motion, regularly seconded, it was received and placed on file.

The CHAIRMAN: We will now take up the discussion of the foregoing reports.

QUESTION: Professor, would you say that raw rock phosphate is profitable the first year?

PROF. HOPKINS: I could not say that.

QUESTION: Is it 2 per cent., do you think?

PROF. HOPKINS: If they use a rather heavy application, they can use it for rotting organic matter. I find the Illinois farmers use

it and then plant corn, and they say they have been getting good results from it, but I think where they used it with manure they got better results from it than where they used it without and they are now averaging \$8 to \$10 per year for every \$1.28 worth that they put on. In the last five years they have averaged, I think, about \$8 for \$1.28 supply.

MR. FENSTERMAKER: I would like to inquire of the gentleman whether the spreading of the manure in floats will help to retain the ammonia?

PROF. HOPKINS: No, sir; it will not.

MR. SCHWARZ: In your report you put nitrogen at 15 cents, phosphorus at 12 cents and potassium at 6 cents; why do you do that?

PROF. HOPKINS: Because that is what they cost. Not phosphoric acid, but phosphorus. Now, a 100-bushel crop of corn requires 23 pounds of phosphorus—of this rock phosphorus. If you will put on 100 pounds of phosphorus with every load of manure, you will get 10 pounds to the acre, that is, 2 pounds to the acre for five years, isn't it? And then, if the land does not wash away, you will have your 100-bushel crop of corn and your land will be richer at the end of the five years than it was before.

QUESTION: You mean that it is richer at the end even if the corn crop is taken off?

PROF. HOPKINS: I do.

QUESTION: If you plant corn one year, and oats the next, and wheat the next, and then grass for the next three years, what treatment does the land need?

PROF. HOPKINS: That is a six-year rotation. In that case we put on 1,200 pounds of phosphorus, and if you had manure on twice, we divide it, and put 600 pounds to the acre each time. You will not need to put on that if the land gets rich, but if the land becomes deficient in phosphorus, we want to put on more than we take off, because we want our land to get rich. When we get the land rich then we put on just what we take off.

DEPUTY SECRETARY MARTIN: Is acid phosphorus injurious to the land?

PROF. HOPKINS: I don't think it is as injurious to the land as it is to the pocket-book. It does tend to increase the acidity of the soil, but we can put ground lime on it and lime tends to correct that acidity. I think the largest objection to it is the cost. I would like you to stop just a moment and consider these materials. We take a ton of phosphoric rock, carrying with it 12½ per cent. of the actual element phosphorus; that is 250 pounds to the ton. That is the phosphoric element, worth 12 cents per pound, not the phosphoric acid. The phosphoric rock you can get for \$8 on cars. Now, you let a manufacturer take this, and he will put it with a ton of sulphuric acid and for \$16 he has two tons, which he will sell for

double that price. In other words, for the 250 pounds of phosphorus in the acid phosphorus you pay \$32 instead of \$8 in the raw rock, which has the element we want. Let us go a step further; he will take two tons at \$32 and mix them with a little nitrate of potash, of which we have enough for 1,700 years in the soil, and he uses that and a good deal of filler to make four tons, and he gives it a name like the "White Ox," or the "White Elephant," and puts it on the market. One sample we analyzed last year we found to contain 2 per cent. ammonia, 8 per cent. phosphoric acid, 2 per cent. potassium, 1 2-3 per cent. nitrogen and $3\frac{1}{2}$ per cent. phosphorus element. They sold it at \$20 per ton and it does not contain one-quarter as much phosphorus as you buy in the raw rock for \$8. We will carry this point a little further: you have four tons of acid phosphorus made out of one ton of complete phosphorus. Now, what do you pay for acid phosphorus?

A Member: Thirty dollars.

A Member: Twenty-five dollars.

PROF. HOPKINS: Probably an average of \$20; well, you have four tons of acid phosphorus at \$20, which contains as much phosphorus as the same amount of raw rock would at \$8.

A Member: Eight dollars and seventy-five cents here.

PROF. HOPKINS: Well, \$8.75 then. Of course you have some nitrogen and ammonia, if you want them.

QUESTION: If your land was short in potassium, and had all the phosphorus it needed, what then?

PROF. HOPKINS: Well, as I said a little while ago, the farmers are using now, annually, more than \$20,000 worth of acid salts. I would probably call it potassium chlorate, but you know it as potassium salts. You can get it cheaper in that form than in any other. We can buy it at \$45 delivered, or you can get cement at \$15.

A Member: Forty-three dollars here.

PROF. HOPKINS: Very frequently members buy cement and get as much potash as if they buy the potash they pay \$64 for. Why should you pay for the shifting and handling of four tons of material on the land when you can get it in one ton?

QUESTION: Do you think we make a mistake in mixing potassium chlorate and muriatic potash in 14 per cent. acid phosphate?

PROF. HOPKINS: That is a very good idea, but I think it comes a little high when you can get the raw rock phosphate so much cheaper.

MR. SCHWARZ: If your figures are right you should do better to get the pure bone.

PROF. HOPKINS: Well, the bone has just the same relation to phosphorus as acid phosphorus. If your land is deficient and you cannot get phosphorus, you can use bone. Bone is even preferable to acid phosphorus, but it is better still to use the rock phosphorus. You can buy three times as much rock phosphorus for the money.

MR. TAYLOR: Would it be advisable to follow up the organic matter that is in the clover and legumes?

PROF. HOPKINS: Well, yes. You can get a scant crop in clover later in the season than you can of legumes.

MR. VAN ALSTYNE: I have been very much interested in this report this afternoon, but I think you are just a little mistaken in some respects. Now, I am getting this question every day, almost, whether people shall use raw rock or whether they shall use the acid phosphorus. The soil of the average man is deficient in humus, and is in need of nitrates. Now, if we find the raw rock will not give him his money back the first year what is the average man going to do? He needs that money to live on; he must have his crops for a living, for the support of his family. I understand you to say that it is better to get the raw rock because it is cheaper, and in that way many men will be misled. I hope you will pardon me for saying this.

PROF. HOPKINS: I did say that, and if I have misled anyone I am very sorry, because it is not my intention. But I have asked half the farmers in Illinois what has been their experience, and they all tell me, "Tell them to use the raw rock; we have used both, and our experience has been in favor of the raw rock."

MR. WING: I have a carload of the raw rock; can I safely sprinkle that carefully on and then put the manure on it?

PROF. HOPKINS: The rock should be a uniform mixture with the manure when it is put into the ground. Let me illustrate: Suppose you take a pitchfork with a bright steel tine and put it into the manure and leave it there for six months. You know what would happen to it. If there are any tines left you can easily break them with your fingers. That is what you call the organic matter in contact with the raw phosphorus.

A Member: Before we get away from that point, will it be profitable to put floats on, turn it under, because I have enough organic matter in my soil to make the required mixture?

PROF. HOPKINS: Well, it might be profitable, but it would be more profitable to put on about eight loads of manure and sprinkle every load.

A Member: The last cement I had was \$6 at the mines.

PROF. HOPKINS: Well I suppose that is true; it costs about \$4.50, I suppose, in bulk, and about \$5 in bags, and it may possibly be more.

The SECRETARY: The Professor has a written question and while he is glancing at it I will make an announcement. There is a lot of corn out there without any marks on it; this exhibit is in charge of Mr. Bayard, editor of the National Stockman and Farmer, and the members to whom the corn belongs will please see him about it, so as to enable him to identify it.

PROF. HOPKINS: I have been handed a letter which I will read; the names have been taken off, so I can give you only the body of the letter. It reads as follows:

"Dear Sir: Your favor of the 24th inst. received and noted. We quote you High Grade Fine Ground Tennessee Phosphate Rock (not acidulated) at \$12.00 per 2,000 lbs. f. o. b. cars Baltimore, net cash.

"We have seen the article written for one of the Farmers' Journals, advising the use of Ground Phosphate Rock, and we feel sure that the writer of the article is in error. Ground Phosphate Rock, whether it be Tennessee Rock, Florida Rock, or South Carolina Rock, is not available unless it is dissolved, and the farmer may just as well use so much sand or dirt.

If Phosphate Rock were available by simply grinding it fine, we certainly would not dissolve it, as we would sooner ship the Fine Ground Rock than the Dissolved Rock, for very many good reasons.

"For the stables and manure heap, we would recommend Genuine Nova Scotia Land Plaster, or Dissolved Phosphate Rock. This same thing occurs every little while, and we are free to say that we have never supplied the same man twice with Ground Phosphate Rock; we would therefore advise those who insist upon making the experiment to go at it lightly, until they have fully demonstrated the value of Ground Phosphate Rock.

"Awaiting your valued favors, we remain,

"Very truly yours,"

PROF. HOPKINS: That letter demonstrates the manufacturer's side of the question. He has something that he is anxious to sell. Now, at the Ohio Experiment Station they have put the raw rock on the land in a part of the field for five years, and manure, and I may say that they have also their the acid phosphorus and the genuine land plaster, and cement, and the phosphorus paid them the best returns. The phosphorus has paid them \$6.97 for every dollar invested for the past nine years, with corn at 35 cents and wheat at 67 cents. The acid has paid them \$4.59 in the same way; the land plaster has paid its cost, and more; but in the end of the one that has paid the largest return for the amount of money invested is the fine ground rock. I have looked over the situation at the Ohio station and I have confidence in their work. I think there is no work more thoroughly conducted than theirs is.

EX-SECRETARY EDGE: I want to ask you regarding the experiments conducted by Mr. Thorne. Have you confidence in them?

PROF. HOPKINS: Absolutely. I think there are no safer experiments in the world than those conducted by Mr. Thorne.

The SECRETARY: Mr. Edge, I am sure, does not mean any reflection on Mr. Thorne's work; he is simply asking for information.

DR. HUNT: I also want to know about the experiments of Mr. Thomas, and agree with Mr. Hopkins. I would like to say just a word in this discussion. Prof. Hopkins will not misunderstand me. I am sure. I want to refer to the statement he made that the soil has potassium enough, and it is not necessary to put it on. Now, what is the condition in the eastern part of the United States? Now, I was born in Illinois and know the land that Dr. Hopkins experiments on as well as I know my own children. I know Ohio fairly well; I have spent four years there and have made experiments there. I have also experimented in New York and know a little of Pennsylvania.

Now, you may say that one-seventh of the hay raised in the United States is raised in New York, on the Dunkirk clay loam, and

there we obtained the best results with nitrogen. When we put on 160 pounds of nitrogen and 320 pounds of phosphorus we got the best results—better than when we put on 160 pounds of nitrogen and 640 pounds of acid phosphorus. When we put on the phosphorus alone we got no results. When we put on the nitrogen alone we got good results, but when we put them on both together we got better results.

Now, this is nothing against what Dr. Hopkins says, and what he says is gospel truth. He lives in Illinois and in different climates you get different results. I merely mention this as a matter of caution. I have come to the personal conclusion, and I think that three years of work have demonstrated to me, that in the eastern part of the United States the importance of nitrogen is greater than that of phosphorus. It is only an opinion based on three or four years' work and does not deserve to be compared with the excellent work at Wooster, Ohio, for the past nine years, and also with the excellent work done at the University of Illinois.

PROF. HOPKINS: I think I will modify my statement that the hill lands are most deficient in nitrogen, and the other lands in phosphorus.

MR. WING: What is the original condition of the phosphorus? Is it in a similar condition to the floats?

PROF. HOPKINS: No, sir; it is in the condition of ground rock; originally it was all in that condition, but some of it has been taken up by growing crops and has stored the organic matter, and a little of it now is in the organic matter, but the larger part of it is still in the ground rock.

MR. RODGERS: Is there any way by which the average farmer can tell when it is in the soil?

PROF. HOPKINS: I think the average farmer can do something in the way of experiments by way of peat or seed, but I think the work should be done by the experiment station at the expense of the state. Illinois is now doing it, and the cost is a mere bagatelle compared with the importance of the work. They expect to complete the work of mapping the state in this manner is about twelve years. If the same thing were undertaken in Pennsylvania it would not be much more of an expense than the cost of your space at the St. Louis Exposition, and, by the way, how much did you just pay for your new Capitol?

QUESTION: How about calculating the condition of the land by rotation? Can we do that?

PROF. HOPKINS: That has been dispensed with, because a good many people who wrote about that knew nothing about it. For instance, they tell us we have one-tenth as much potassium there as we need, and we find we have as much nitrogen as would be required for five rotations, and then we take another soil and we find as much potassium there in the first seven inches of soil as 100-bushel crops of corn will take out in 1,700 years.

QUESTION: How much of it is applicable now?

PROF. HOPKINS: There is none of it applicable now; I don't believe there is enough potassium or nitrogen on any farm, today applicable, to make a crop of corn. It is gradually liberated during the season.

QUESTION: What about basic slag?

PROF. HOPKINS: As you draw slag from steel works, it is certainly very valuable, but I would not place any more value upon it than upon any other form of phosphorus. The bone materials I count of as much value. The only difference is that the slag carries with it some lime. Now, lime is cheaper than phosphorus, and when you can get pure ground calcium carbonate so cheap, you don't put much value in what is carried in slag. But if you can get the phosphorus in slag as cheap as you can in acid phosphorus I would take the slag for the lime.

QUESTION: What is the action of slag?

PROF. HOPKINS: Well, I suppose in a high grade of slag, the phosphoric acid would be about 7 per cent.; phosphorus about the same, possibly from 16 to 18 per cent. of acid phosphorus. It is about as rapidly applicable as the bone, and acid phosphorus. It is not quite as soluble.

MR. WING: Now, I rather agree with the Professor when he says that when the phosphorus is taken out of the soil the crops will not grow, but when it is put back, it produces more than 100 bushels per acre. I am glad to note that he sets the standard at 100 bushels. What did you average, Professor?

PROF. HOPKINS: About 88 bushels on the average, 70 pounds to the bushel.

The CHAIRMAN: Are there any further questions on this point?

The SECRETARY: Now, Mr. Chairman, I take a great deal of credit in asking Prof. Hopkins to come all the way from Illinois. He manifested a willingness to come, if it was possible that he could be of any service to us here. Now, I think he manifested such a courtesy in coming to us to talk so interestingly and instructively that it is worthy of a vote of thanks, and I move that we tender him a rising vote of thanks.

Duly seconded and agreed to, a rising vote of thanks was tendered to Prof. Hopkins.

On motion, seconded and agreed to, adjourned until 7:30 P. M.

Wednesday Evening, January 23, 1907.

The meeting came to order with Mr. McClellan in the Chair.

The CHAIRMAN: The first number on the program is the report of the Committee on the Identification of Fruit. Is Dr. Funk ready to report?

REPORT OF COMMITTEE ON IDENTIFICATION OF FRUIT.

DR. FUNK: I will have to ask the indulgence of the house. I really forgot I was on the program for this evening until after the meeting this afternoon, when it was too late to do more than look cursorily at the display. I find here,

One plate of pears for identification.

Two plates of Northern Spy and two plates of Rhode Island Greening exhibited by R. J. Weld.

One plate Bullock Pippin, two plates Jonathan and one plate Memphis Pippin exhibited by A. I. Weidner.

One plate late winter pears exhibited by Mr. Snively, the "Glon Marceau."

A display of fruit by Mr. Naginey, among them an apple for identification.

Several plates of apples without names attached.

In regard to all this fruit I want to say it shows a negligence in spraying. It needs a fungicide, like Bordeaux mixture. There is not much codling moth, but there is some evidence of it, and I think the owners will do well to take every precaution and see that the fruit is properly sprayed.

MR. SCHWARZ: What did you say was the name of that winter pear?

DR. FUNK: The Glon Marceau. A little of it will go a very great way. The best thing to do with it is to feed it to the pigs.

The CHAIRMAN: What shall be done with this report?

On motion, duly seconded, it was agreed to receive it and place it on file.

The CHAIRMAN: Next is the report of the Committee on Identification of Vegetables. Is there any report to make?

MR. HERR: We have no report to make, because there is no display of vegetables.

The CHAIRMAN: We will then proceed with the next number, the report of the Committee on Legislation.

MR. KAHLER: I will have one of the committee read that report in a few minutes. My sight is so bad that I will not undertake to do it myself as chairman of the committee.

The CHAIRMAN: Until this committee is ready to report we will take up the next number on the program, which will be the report of the Mineralogist, Col. Demming. I see he is here now.

Col. Demming then read the Mineralogist's report as follows:

REPORT OF MINERALOGIST.

BY COL. H. C. DEMMING, *Harrisburg, Pa.*

The correspondence on mineralogy alone during the year 1906 exceeded one thousand letters. Inquiries came from many other states and countries. The following is a sample from Iowa:

"Can you refer me to localities in Pennsylvania where large deposits of quartz sand or a good grade of building sand can be found? It is my desire to locate such a deposit for the purpose of establishing an industry for the manufacture of sand lime brick. The sand for this purpose should be high in the percentage of silica, and should be sharp and free from loam." He was informed of more than fifty localities. He has also written that he wants 1,000,000 cubic yards of sand with which to start operations.

Another gentleman came to Harrisburg from New York City in search of 18,000 tons of first-class building sand. He also was referred to numerous localities.

In the same line was an inquiry from a corporation manufacturing window glass. Judging by the tone of the correspondence they consume a trainload of glass sand every working day at their seventeen different plants.

During the year numerous other inquiries were made for silicates similar to the aforementioned, and all the inquiries answered satisfactorily except in one instance, that for a large deposit of loess. Loess is mentioned in but few standard authorities on mineralogy or geology, and any information respecting it is very unusual. It is a fine earthy deposit, mostly silica, following the courses of valleys or streams, like alluvium, but without division into thin layers. One of its constituents is invariably a calcareous material, generally in concretions. It is most frequently found in elevated terraces along the broad parts of large valleys, as on some parts of the Delaware and Susquehanna rivers; but the fine particles of coal which are carried down our largest streams, lodging with or on the loess, have destroyed these deposits for commercial use, viz: the manufacture of cement or similar products. Portland cement, which has now become essential in the making of concrete or artificial stone, originated in England by the mixing of 70 per cent. of chalk with 30 per cent. of the alluvial clay or mud within the lower tidal basins of the Thames and the Medway, the mud supplying the silica and alumina in proper condition, and the chalk the calcium carbonate or lime. In this connection there has been serious talk of forming a cement trust. It is doubtful whether such a combination can long exist in Pennsylvania, as in nearly every county of this Commonwealth can be found all the necessary constituents of the best hydraulic and Portland cements.

Inquiry is made for deposits of asbestos. The locations of the mineral have been mentioned in former reports. There is an in-

creased consumption on account of its uses as an insulator in electric wiring.

The demand for barite (sulphate of barytes) is increasing and belief now is that there is a large body of this mineral near Bridgeport, Bedford county. Heretofore most of it was mined in Berks, Blair, Clearfield, Franklin, Fulton and Huntingdon counties, though in none of the counties as extensively as is southern Virginia. It is worked up (sparingly) into barium salts and as an ingredient in paints. When used too freely in the latter it becomes an adulterant.

The extraction of bromine from the brine of abandoned gas and oil wells is receiving attention from a number of capitalists, and the product will be materially increased in Pennsylvania this year.

Clays of various qualities are more freely and eagerly sought for than heretofore. Sometimes for days that will be the subject in our mails. It seems that every county has a large supply of one kind or another. So important has the clay industry become that a number of the states have issued separate reports on the subject. The State of New York has published a volume of over 900 pages on clays found within her borders. It would well repay the Commonwealth of Pennsylvania to follow suit, as we have larger bodies and in some instances of finer quality than any of our sister states. Men of capital go elsewhere than to Pennsylvania for clays because other communities are more liberal in their publications given all the information possible on the subject. Much foreign capital skips over Pennsylvania for investment elsewhere, first, because we have no State museum of our natural resources, secondly, because our economical geological and mineralogical literature has been so scant, from lack of appropriation; and thirdly, because every state surrounding ours has a salaried State Geologist who is liberally paid to gather up all useful data and publish them in separate annual reports, whereby capital is attracted to their territory, large industries established, and communities made rich and prosperous. It is rather mortifying to receive voluminous annual geological and mineralogical reports from other states—New York, New Jersey, Maryland, Ohio, West Virginia, etc.—and not to be able to send any in exchange. If it were not that our resources of coal, petroleum and natural gas are in such excess, compared with most of our neighbors, we would be falling rapidly behind in population and prosperity, because we are not advertising our natural wealth like most of our sister Commonwealths.

During the past year coal mining has been carried on more extensively than heretofore and our output would have been much heavier if the transportation companies had supplied the cars. I examined a number of large bituminous coal mines where the men could work but little more than half time because of scarcity of cars to haul the product away to market. This is true notably in Allegheny, Greene and Washington counties, where I spent nearly a week under ground. Some time was also spent investigating or locating coal lands in West Virginia, a state of marvelous natural resources both of coal, gas, petroleum and timber. The coal beds of Western Pennsylvania extend through our neighbor on the southwest, and clear on to Alabama, the total area underlaid with good, merchantable coal, being more than 80,000 square miles, or nearly twice as

large as all of Pennsylvania. The Pittsburg bed within our borders is 2,015 miles in extent, with, in many places, from three to six other good coal beds either above or below it. Whoever says there is to be a natural coal famine in this century or the next has either not reckoned at all or gone wild in his calculations.

The increase in the price of copper from 12 to 25 cents per pound, and the price rising, has stimulated the mining of copper ores wherever found. The output of copper in Pennsylvania this year will probably outstrip any previous twelve months. It may be of interest to state that the Cornwall ore banks in Lebanon county have also produced all told over \$700,000 worth of metallic copper.

Corundum and emery are now mined successfully in Berks, Chester and Lehigh counties.

The fluorite deposit of northern Fulton county remains undeveloped, while manufacturers of hydrofluoric acid at Easton and Philadelphia are obtaining their supplies of the crude mineral from Southern Illinois.

Gold bearing ores have been found in 29 counties of the State, but in no instance has the gold been extracted at a profit sufficient to warrant extensive mining. The largest known gold placer deposit lies under the most populous part of Philadelphia. Where excavations have been made for cellars along Market street from Third to Broad, free gold could have been extracted from nearly every cubic foot of earth or gravel taken from a depth of 12 to 20 feet. This has been demonstrated a number of times by the use of a miner's pan. Some of the material from a large cellar recently dug at the southwestern corner of Thirteenth and Market streets would have been found to yield at the rate of 25 cents per cubic yard, or nearly 100 per cent. richer than the best paying larger placer in California. This gold that underlies Philadelphia has apparently been carried there from some point on the Schuylkill or Delaware river. The source has never been discovered.

The graphite industry of the State is making good headway, the product coming principally from Berks, Chester and Delaware counties.

Ganister rock (another silicate) is shipped in immense quantities from Blair, Huntingdon and Mifflin counties for furnace purposes, there being a good market also in other states. From some of it quantities of silica brick are made near the source of supply. There are large bodies of this rock in northeastern Fulton county.

Iron ores are attracting more attention than for years. New processes of iron manufacture permit the use of Pennsylvania ores and these, combined with the gradual rise of crude ores from the great northwest, have led to the revival of an old industry, which will be more and more marked from this time forth.

The large deposit of melanterite (native copperas) near Olivet, Armstrong county, remains undeveloped.

Manganese ores have been found near the northern boundary of Indiana county; but little has been done there in exploitation of the extent of the deposit. In the meantime similar ores are brought into Pennsylvania from as remote points as Asia Minor.

Magnesian ores of fair quality have recently been found in the southwestern corner of Bucks county.

There is a strong probability of a resumption of nickel and cobalt mining in Lancaster county, where good copper ore has also been found.

Natural gas has been struck in greater volume than heretofore. Two wells—one near Kane—have thrown out, it is roughly estimated, as high as 200,000,000 cubic feet of gas in 24 hours and the roar of one of the wells could be heard eight miles away. This has given a remarkable impetus to the natural gas output of our State. I hope the present Legislature will make an appropriation whereby there can be obtained the amount of natural gas and petroleum we are producing annually; also that there can be published a revised colored geological map of the Commonwealth giving the gas and petroleum territory, and, if possible, the location of every well, its depth and output to a specified time. This would be a great aid to intending investors in the State and would also afford a basis for taxation of products which now escape all Commonwealth assessment, where other states derive a good revenue. The fact is that we are being depleted of this wealth, without return, save in the increase of local prosperity, and a population which will go elsewhere as soon as these treasures are gone.

From day to day there is more foreign inquiry for peat and peat deposits, but thus far the most practical work has been done in Columbia county, where a company is digging it out as a constituent for some article manufactured there. Peat has now been found in a number of counties, from Pike on the east to Erie and Lawrence counties on the west.

Phosphorus ores are mined in considerable quantities within 30 miles of Harrisburg, and one of the minerals, wavellite, traced along the South Mountains to the western bank of the Susquehanna river.

Radium bearing minerals have thus far been found in Adams, Schuylkill and York counties, but nothing has been done in a practical commercial way.

Some inquiry has been made relative to the revival of salt manufacturing in Pennsylvania, but little has been done in the matter, though the brines from the deep wells of Fayette, Indiana and Westmoreland counties, can be made to yield the best table salt in the land.

The quarrying of slate in great quantities is still carried on in Lehigh and York counties, with a strong probability of the field extending to Berks, Lebanon, Dauphin, Cumberland and Franklin counties.

Ores containing tantalum and titanium are being sought for in Pennsylvania for use in Europe, the most urgent demand coming from Germany. Titanium crystals, as made in the electrical furnace, are harder than diamonds, and when used in circular saws will cut stone or metals as easily as a common circular saw cuts wood.

Tungsten ores are also wanted. Tungsten greatly improves steel products.

There has been a marked revival in zinc ore mining and several mines in eastern counties, abandoned a few years ago, are again in operation.

Zirconium has been found in some of the iron ores of central Pennsylvania, but thus far in too small percentages for special extraction.

One very commendable feature in connection with our new State

Capitol is the establishment of a State Museum in the old executive building. Thus far few if any minerals have been obtained, but a fair exhibit of mineralogy of Pennsylvania will soon be assured. Then we will have a place where our natural products can be studied with decided profit to all comers. In the building up of the division of mineralogy it has been urged by your Mineralogist that at least three samples of each mineral be secured, the first as an average of the outcropping, if there is any outcrop, then an average sample of the mineral as mined, then an ideal specimen. Thus one will have a guide to the finding, in undeveloped sections, of every mineral that can be reasonably looked for in any part of the State. Here is where our colleges and universities have lacked, as students have usually been shown extraordinary samples, which are seldom, if ever, found in practical out-of-door work.

As more earnest and intelligent attention is being given to mineralogy every year, we believe that Pennsylvania will ere long take a front rank and every section of the Commonwealth be correspondingly benefited.

The CHAIRMAN: What action shall be taken on this report?

On motion this report was received and filed.

The CHAIRMAN: We will next take up the reports of the Geologist, in order to give Col. Demming a little rest, we will listen to Mr. Stout first.

Mr. Stout then read the following report on Geology:

GEOLOGY AS RELATED TO AGRICULTURE.

BY MR. W. H. STOUT, *Pinegrove, Geologist.*

The tertiary period, the latest deposit, during which animals and plants developed, and by their death and decay added their remains to the disintegrated rock, now forms that portion of the earth's surface devoted to use in agriculture.

A large part of Pennsylvania soils consists of stratified rock, deposited by water action, forming the shales, sandstone, clays and limestone, largely derived from the older formations, the granite and traps, the material now supposed to form the interior of the earth in a molten condition.

Extinct and active volcanoes found on many parts of the earth have no doubt produced the existing topography of valley and mountain, together with the water from rain ever carrying into the oceans the disintegrated particles liberated through frost and heat, forming new deposits in coast regions and river deltas, at the same time reducing the elevation of continents.

As a result of the various rock strata through which water courses flow, the river bottoms and deltas are of the most productive soils, usually containing the elements of plant requirements, in combination with the particles of minerals, sand, clay and substances of animal and vegetable origin.

There are in this State so many varieties of soil, varying in physical and chemical constituents besides elevations, changing the climatic conditions, that to bring them under review would be a task too large for any one to undertake and present in an intelligent manner in a brief article. Taking the several limestone foundations, the sandstone quite various, the shales of various ages, and the clays derived from these, together with those soils derived from granite and glacial action, each differing from the rest, are of interest to agriculture and is receiving more attention than heretofore. It is to be regretted that there exists such a confusing nomenclature in geological literature, to which more is being added by recent writers and investigators.

Considered solely as a medium upon which to grow crops, soils of the same physical characteristics may or may not be productive in proportion to the available elements they contain. However rich in fertility a soil may be originally, constant cropping without restoring the elements abstracted will in time be exhausted and only equal to a soil naturally poor and unproductive.

The theory of almost inexhaustible mineral elements in our agricultural soils may be true to the chemist; it is not true in practical farming, the latent elements not being available to plants; if they were it would be folly to seek mineral elements from various sections of the world to replace what is removed with crops.

The CHAIRMAN: What action shall be taken on this paper?

It was moved and seconded that it be received and placed on file.

MR. KAHLER: The Legislative Committee is now ready to report. Mr. Herr will read the report, if there is no objection.

The CHAIRMAN: We are now ready to listen to the report of the Legislative Committee.

REPORT OF THE LEGISLATIVE COMMITTEE.

Mr. Chairman and Members of the State Board of Agriculture:

Your Committee on Legislation submits for your consideration the following report:

The recommendations embodied in the report of your committee and adopted by this Board one year ago, asking for some needed legislation to protect the interests of the farmers of the State and all others interested in agriculture, have only in part been referred to the proper Legislative committees, and some of them are now being considered by them. None have as yet been enacted into laws, for no Legislative sessions have been held since our last meeting that could take proper action, and you will now find that a part of the recommendations of last year are embodied in the report.

And we again recommend an amendment to the township road law, wherein it provides that the State pay 15 per cent. when the township votes to pay their road tax in cash, and ask that it may, be made 50 per cent. instead. We also further recommend that the

words "county" and "township" be eliminated as to the application for new roads from the State highway law, and the State Highway Commissioner to have entire jurisdiction under the bill to proceed without the consent of the county commissioners or township supervisors, which, in our judgment, only complicates and hinders the working of the bill and delays the work of the Commissioner, and it would also relieve local taxation to some extent and place the additional tax on the State, where it justly belongs, and in order to relieve the excessive tax burden on real estate, we favor a two-mill tax on all corporate and personal property in the State, to be levied and collected annually, and expended only for public roads, and distributed to the several counties according to the road mileage in each county, to be used annually, one-half by the State Highway Department and one-half by the townships, for the reconstruction and maintenance of permanent public roads. We recommend the amendment of the road law so as to authorize the planting of trees along the roads constructed by the State. Also recommend an appropriation of at least six millions for two years from June 1, 1907, in addition to the sum now available, in order that the reconstruction and building of roads may not be delayed but pushed rapidly forward by the Highway Department.

We also recommend an increased appropriation to the public school fund and that an appropriation for the State Normal Schools be made a separate fund.

Resolved, That we recommend all of the appropriations asked for by the trustees and authorities of the State College be granted, that our State Agricultural College may no longer stand in the rear rank of agricultural colleges of our sister states.

We also favor an increased appropriation for the township high schools, which will encourage townships to establish such schools.

We recommend such legislation as will enable the Dairy and Food Division to fully enforce the provisions of law already made and we favor the enactment of law that will protect the manufacturer and consumers of all food products against adulteration by fraud.

This committee respectfully recommends a law creating the Department of Agriculture be so amended as to create a Division of Horticulture, at the head of which shall be a practical Horticulturist.

We also recommend that such laws be enacted by the present Legislature that the great water powers under control of the State should be so protected that when franchises are granted in the future, such franchises should bring a revenue for the State, and be limited in time.

We also recommend that the present Legislature enact a law giving trolley companies the right to carry freight and also giving them the right of limited eminent domain, and as we do so, deny them the use of our public roads, as it endangers travel and greatly interferes with the improvement of our public highways.

While it is recognized that agriculture is the seat of prosperity, of our country, we do recommend that the legislature make a larger appropriation towards carrying on farmers' institute work. We would, therefore, recommend that \$50,000 should be appropriated instead of \$35,000.

We favor the abolition of the "work tax" system, believing all road

taxes should be paid in cash, provided that the State pay 50 per cent. of the amount raised.

We favor the passage of a law which will require, after some reasonably distant date, the use of wide tires for all hauls over 1,800 pounds. (Signed)

A. J. KAHLER,
JASON SEXTON,
J. N. GLOVER,
S. S. BLYHOLDER,
MATTHEW RODGERS,
Committee on Legislation.

Also the following report from the Committee on Drafting a Bill Regarding Live Stock:

In view of the fact that thousands of dollars' worth of honey is annually imported into the State, while, owing to the fact that brood diseases have so reduced the number of colonies of bees that there are not enough left to properly pollenize the flowers, while thousands of dollars' worth of honey remains ungathered, therefore

Resolved, that we ask the Legislature to pass such laws as will eradicate the diseases that have done so much damage to this industry in the State. (Signed)

GEO. G. HUTCHISON,
DR. E. E. TOWER,
E. E. CHUBBUCK,
J. W. NELSON,
J. H. FUNK, M. D.

The CHAIRMAN: Gentlemen, what is your pleasure in regard to this report?

On motion, regularly seconded, it was agreed to adopt it as read.

The CHAIRMAN: We are now ready to listen to Col. Demming's report on Geology.

This report is as follows:

REPORT OF CONSULTING GEOLOGIST.

BY COL. HENRY C. DEMMING, *Harrisburg, Pa.*

One year ago we mentioned the great increase in value of a farm that had been investigated geologically, and the owner made wealthy by the discovery and development of a quartzite of extraordinary purity. The rock deposit has been worked throughout the year and many tons sent to market at good prices. The operation is to be increased until the output shall exceed 50 carloads a day.

Within 50 miles of that place another farm owner has opened a large deposit of granitic rock, a quantity of which has been used as the exterior material of some of the most beautiful and costly residences and churches in Berks and Lehigh counties. It is to be regretted that this granitic quarry was not fully opened when the Com-

missioners were looking for stone for our new State Capitol. Until recently the United States authorities at Washington were stating that no granite had been found in this Commonwealth, and that consequently we were obliged to purchase anything of that character from owners of granite quarries in other states. This day will soon be past, for we have hills and small mountains containing as good granite as has been found anywhere in this country.

In some of the mountain ranges of Pennsylvania there are immense bodies of rock composed almost entirely of iron ore and silica. By a little skillful manipulation an industry could be built up in nearly half of our thinly settled counties in the preparation for market of what is known as ferro-silicon. Where the iron contains 10 per cent. silicon the present market price is \$30 per ton; 20 per cent. silicon, \$40 per ton, and 50 per cent. silicon, \$106 per 2,000 pounds. Many have expressed themselves as wondering why these numerous mountains of our State were made; but as the years pass by something is found, partly hidden away, toward solving the inquiry.

Geology includes in its scope the natural waters of the earth. How little we value them, and how little we apply them to the uses of man outside of the old-fashioned ways. Let me call attention to another use of our streams, and in order to do this we will take the facts as given in the *Youth's Companion*, of Boston, as well as from the *Technical World Magazine*:

"One of the most interesting farms in America is to be found in Oneida county, New York, close by the historic battlefield of Oriskany. It is the farm of Mr. E. B. Miner, and is attracting attention because of the way in which much of the work on it is being done by Oriskany creek. One by one the old crank handles, familiar emblems of drudgery to every country boy, have been thrown away, until today churn, separator and grindstone whir merrily without the labor of a hand upon them. Little more than a year ago one of the sons of David M. Miner, who then owned the farm, persuaded his father to begin harnessing the little creek which plunged merrily down through their farm to its junction with the Mohawk.

"In October, 1905, a dam was begun, having concrete wings and foundation and leading to a concrete wheel pit. A head of four and a half feet was obtained with a constant flow of 4,000 gallons a minute.

"A thirty-inch upright water-wheel was installed, which developed seventeen and a half horse power, and to this was attached a twelve-and-a-half-kilowatt generator. Fifteen hundred feet of bare aluminum cable led the current to the house, where twenty-five sixteen-candle-power lamps were installed; and to the barn, where eight more were placed.

"Two months after the dam was begun the water was sent through the wheel and the lights turned on. Since then the power plant has run continuously night and day, with no attention except supervision and oiling two or three times a week.

"Fuel in the Mohawk Valley in mid-winter is expensive both in money and in the labor required for maintaining fires. Mr. Miner's son installed a 4,000-watt heater, which heats two rooms—about 2,400 cubic feet—to a temperature of seventy-five degrees when it is zero outside. That put the old coal stove out of business.

"In the creamery, where the milk from twenty-five cows is manufactured into butter, there is a separator which must be turned 7,400 revolutions a minute morning and evening till the milk of the whole herd has gone through it. A small motor—half horsepower—was mounted so as to be convenient, to this and connected to it by a belt. It did the work to perfection, and the first crank-handle was thrown away.

"To make the action more complete, a bucket of water was tripped over the separator, and a float arranged to break the circuit when the last of the milk ran out. Now, when the separator process ends, the motor is automatically shut off, the water dumped in, the motor started again for a moment, and the separator rinsed and emptied, all without a hand being put to it.

"The churn, a big barrel affair, was mounted on a swivel platform, and brought into line with the same motor; and then a grindstone, the terror of the farm, was added.

"The hand-pump which furnished water to the house tank in the attic was discarded, and the little motor took over that task. Wood was still burned in the kitchen. A larger motor was acquired, coupled to a saw, and the job of sawing wood was lightened of its labor.

"Electrical flat-irons were provided for the kitchen; electric fans, a motor-driven freezer and an electric cooker will be added for the summer comfort.

"Only a small part of the power of the creek is used as yet, but plans are under way for increasing, to the accomplishment of other farm tasks, the ready service of the little creek which for so many years ran idly by the farm, waiting to be harnessed."

What I said six years ago, in an address to the citizens of Franklin county, Pennsylvania, I believe will apply, to a more or less extent, to nearly all the counties of this Commonwealth:

"I have found by careful observation and examination that your streams are capable of generating enough electrical power to not only run every train of the Cumberland Valley and Western Maryland, but fifty times the machinery now employed from mountain range to mountain range, and from the Potomac to the Susquehanna, with enough over to illuminate not only every street of every town, but every country road and by-lane. And then enough left to light up every building almost as brightly as daylight, besides furnishing motive power for every barn and house, and heat for every room of home. Yea, more; and a surplus for other counties. And all this not utilized because Aladdin's lamp though hanging low, is not rubbed until the good genii appear, and ask what will you have us do? In other words, the good people of your county are so contented and happy with their peaceful lot compared with others of their fellows, that the nubbin fruit is good enough, though golden pippins hang just beyond.

"The New Franklin County.

"Permit me one concluding picture of Franklin county in the ideal future—not the next century, but this. Every farm and home beautified by Nature study; every business place a model patterned from Scotch, Irish, German and American originality; every dwelling

place a place of health, contentment and prosperity; houses not built of frame or brown red brick, but of pure white Romanesque blocks made from the kaolin beds along the Blue Mountains as well as those of the South Mountain; sidewalks of white chalcedony, quarried from the archean hills; curb stones of greenish white potsdam sand stones of Mont Alto; paved streets and country roads from cream-colored vitrified brick manufactured near Richmond furnace, and north and south of Shippensburg; public buildings and churches of the pink tint and grayish white stone northwest of Mercersburg; employment in innumerable establishments resulting from development of sands, and clays, and earths, and rocks, and other minerals, only a few of which have been indicated; young ladies and young men also employed, the former in etching and engraving Bohemian glasses, and polishing and fitting lenses, and doing other skilled work which only the deft and gentle fingers can do; and the latter in rolling plate glasses, etching and hand cutting flint glass, and kindred work, all from the material from your own delectable hills and mountains. Middle aged men managing or watching the automatic machinery of mills and factories run by electrical power generated from your own streams, and the middle-aged women superintending the homes where electricity does the cradle rocking, the churning, the washing, the sewing machine running, aye, the heating and cooking, as well as the lighting, and household drudgery is known no more, for the Conedogwinet, the Little Antietam, the Conococheague, and Back creek and Cove creek, by turning of turbine wheels are all merrily helping to make home happy, and Franklin county one of the most desirable spots for mankind on earth.

"Electric Fountains and Liquid Air.

"Then for outdoor adornment, amusement and recreation the electric fountain in the yard, and in every public square of every town and hamlet; family motors propelled by electricity, or compressed or liquified air of best home-made brand; a series of fairy-like lakes where are now rumbling streams; the shores flower-embroidered by day, brilliantly illuminated with many colored lights at night, and electric launches flitting here and there, with merriment, music and innocent laughter; hill and mountain sides dazzlingly bright with arc, incandescent and helium lights; valleys in early evening shining with brightness and social cheer; passenger or freight trains moving even more rapidly and safely than now, with no noise, no flying cinder, no smoke, for all such motive power is either electric or by liquid or compressed air, or denatured alcohol; rents lower, in exceptional cases of new comers—all others owning their own homes—because taxes and all living expenses are less, and wages are higher than ever before. And through every phase of human life in Franklin county, because her people have taken advantage of what Nature has given them, and with the change for the better, most of the sorrows and sighings have forever flown away."

The CHAIRMAN: What action shall be taken on this report?

On motion, duly seconded, it was agreed to receive the same and file it for publication with the rest of the proceedings.

MR. McHENRY: I would like to offer the following resolution:

"BE IT RESOLVED, That we, the members of the State Board of Agriculture of Pennsylvania, in annual session assembled, do hereby express our appreciation and thanks to the Hon. N. B. Critchfield, Secretary of Agriculture, and to the Hon A. L. Martin, Deputy Secretary, and Director of Farmers' Institutes, for the able and excellent program prepared for this meeting and wisdom shown by the arranging for this joint meeting of the several organizations here assembled; and that we hereby express our sincere thanks for their untiring efforts in the furtherance of the agricultural interests of this great Commonwealth.

"Hoping that we may be able to share with them the benefits and pleasures of many more such meetings as their assistants and co-workers, this resolution is respectfully submitted."

MR. HERR. I move that we pass that by unanimous vote.

Seconded and agreed to, and resolution passed by unanimous vote of the members present.

MR. HERR: Before we proceed further with the program, I have here the resignation of Col. Demming as Consulting Mineralogist. What shall be done with it?

Hearing no objection, the same will be accepted, and recorded with the minutes of the Board.

The following address by Mr. Van Alstyne, was read at the joint meeting, held on Wednesday evening, and while it will be published in the proceedings of the Pennsylvania Live Stock Breeders' Association, it is also included in this report by permission of the Secretary of the above named Association. The address is as follows:

RATIONAL FEEDING.

BY MR. EDWARD VAN ALSTYNE, *Denmark, N. Y.*

Mr. Chairman and Friends: If anybody wants to go out, I will not be offended, because I think it is a shame to inflict another speech on this audience when it is nearly ten o'clock, but the Chairman has insisted on my speaking, so I shall have to do so.

I want to lay down three general propositions on the subject of feeding, and a great deal of what I say will be along the foundation which Mr. Fuller laid down this afternoon. Some of you gentlemen have probably found out for yourselves much of what I am going to tell you, but it is those who have not progressed along the line of feeding as they perhaps should have done, that I want to help, If I can, and the others of you will have to bear with me.

Our general purpose in feeding animals is to keep them in good condition. I want to make that emphatic, because from some things I expect to say you may infer that I would underfeed. I want, therefore, to say first of all, that we must keep the animal in good condition. She must be kept so for herself, and for our good.

To illustrate, take the matter of summer feed. If we allow, as we often do, the cow to run down in flesh during the summer, she will never do as well again until she builds up her system once more.

Then, do you believe in adding grain to the pasture? Now, my position on that point is this: I am fully satisfied in my own mind that if we can add our forage crop to the pasture so as to keep her up in flesh and milk, we do not need to feed the grain. But even if in supplementing the pasture we keep up the milk flow, but lose flesh, it is better to feed grain, even if we do not get profit on our grain for the time being.

To illustrate—I speak of my own work, because I am more familiar with it than anyone else's—last year we did not feed grain during the summer, and along about September I noticed that my cows had lost flesh. There was no question about that; then I began to feed grain, and, friends, before the pasture of the next year, I know that I fed twofold more grain than I would have done if I had fed a little grain during the summer.

The next proposition I make is this, that there is a difference between feeding cattle for profit, and feeding them for production. "What," you say, "when you feed for profit, don't you feed for production?" Why, certainly not. Take, for instance, the Pan-American Dairy Tests. The people who had charge of the Holsteins and Ayrshires fed them from sixteen to eighteen pounds of grain every day, in addition to plenty of good silage, and then they pointed with pride to the record of their cows, but at the end of the week, when the cost of their feed was taken from the value of this production, instead of standing at the head, they went down fourth or fifth, and the second week was a repetition of the first. Then they saw they had to do something, so they gradually reduced the grain rations to ten or twelve pounds, and at the end of the third week, they had more profit on less milk and less feed.

I don't know how it is in Pennsylvania, but in New York, since the doctrine of protein has been preached, our folks find that they get more milk for the same amount of feed. In many cases the question with the farmer has only been, "How many cans of milk can I carry away today?" They do not stop to think that they are carrying away the milk and carrying home the feed. When their check comes, the most of it has gone to pay the feed dealer and little left to pay the interest on the mortgage or buy shoes for the babes. They are feeding for production and not for profit.

Now, as to the character of the feed for our animals. Let us then proceed to the subject of the chart:

First, the green feeds, because they are the best with pasture, at the head.

Next, the dry fodders, feeds that are grown on the farms. It seems to me that one of the objects in keeping a dairy cow is to turn some of the raw, crude, cheap material, through the medium of the dairy cow, into the finished product, and for that purpose it seems to me that we should use as much of our home product as possible.

Every farmer knows that the best feed to give his cows to make them produce milk, is pasture grass, and, if you will notice, pasture grass is 80 per cent. water. Now, if you will put that cow into the

stable, she will eat between eighty and one hundred pounds of it, and do very well on that alone, and after you have satisfied yourself on that point, take this same grass and dry it, and where you had a hundred pounds, you have eighteen or twenty-five; now, you will take this same feed and give it to her, with all the water she can drink, what will happen? She will get thin and dry up.

Now, we want that cow to be in a healthy condition in the winter, and if we have not the pasture grass on which she thrives, we can give her some other succulent feed. You will find here a line of green feeds, three-fourths of them water. You will notice, also, that the dried foods, instead of having 75 per cent. water have less than one-fifth, and as the water is decreased, the crude fibre is increased, and instead of 10 per cent. of it, we have over 40 per cent.

In the dried stalks much of the starch and sugar, which in green corn is digestible, are tissue in woody fibre. So you will find roots which are 90 per cent. water. Any breeder of sheep will tell you that he will get more growth from less grain if he feeds roots.

What about the protein? It is necessary in these days to understand such terms as "protein" and "carbo-hydrates" and "potassium," and other words that were mentioned this afternoon. Well, we have learned to take them in as we have such words as "auto-car" and several more of these terms.

The protein is the element in the feed that makes the lean meat, and the blood. If there is any man who does not understand this, I want to make it clear, if possible. This element in the food will do all this: it will make the lean meat, and the blood, and you can't get it without it. The man who feeds it is building up the bone and muscle, but most of the feeds grown on our farms are deficient in it. Prof. Hayward has told us what he knows about growing the pig, and that he has to have a good deal of protein with his rations.

Now, we have a young heifer, and we expect her to make a success as a cow, so we must give her the material to build up her body and she can't get it out of the starch and sugar in the food.

Then we have the dry corn, and there is where I think the farmer is making a mistake. Perhaps she is within a few months of calving, and we don't expect her to give us much milk, so we do not feed her protein, but put her on coarse feed, and fail to take into consideration the effect it will have in the development of that calf. Take a case of abortion at about seven months; most of them occur about that time, and I believe that many of them are due to the fact that she did not receive the necessary food element to produce the strength necessary to bear that calf. Unless she is properly fed, she will have to take from her own body to develop that calf, and probably fall off in flesh. Now, I would not feed that cow during the last few months of pregnancy the same concentrated foods as when she is in full milk, but I would give her the cooling protein feeds that would give her the strength she needed. I have heard people talk as though there was no benefit in carbo-hydrates. Why, certainly there is; but the point is, we have most of them in our own feeds, and with this in view how can we bring it down so as to benefit us in a practical and economical manner.

What do we feed in the winter, when we have no pasture grass? Well, we have the silage, which is succulent, but deficient in this protein. I value my reputation, but I will stake it on this proposi-

tion: I will undertake to keep my cattle in as good condition on the silage, and get as much milk, as on the dry stalks and two pounds of grain daily in addition. What does that mean? That I am to that extent free from tribute to the grain dealer.

While we are talking of silage, let me finish up. The corn that we feed our dairy cows can be most economically fed in the form of silage, and I am satisfied that the corn is worth as much, pound for pound, in silage, as it is in meal. In my country it costs about one-tenth to husk the corn, and we have to give the miller about one-tenth to grind it for us. There is one-fifth of the value of our crop. Furthermore, I believe if we add so much corn to our silage that our gutters are full of the corn, it is a waste and an injury to the cow.

Now, if we go and eat a big dinner and on it go and eat a big piece of mince pie, see what happens. The same thing happens to the cow. I claim that if we feed our cow more than she can digest, it is a positive injury. I have fed the cows lots of good corn meal that was not necessary, and both the cows and I lost by it. I believe that not more than sixty bushels of corn per acre is as much as we can safely put into silage, when we give the cows all the silage they will eat twice a day. But when we have all the corn we need the silage; it does not pay to add corn to it in feeding. Then what are we going to feed with it? We must give that cow more protein, but where are we going to get it? Perhaps we have the corn stalks, which are high in fibre and heat-forming elements, but not rich in protein. We do not get it in the corn stalks, nor in the silage, nor in the corn meal, and I want to feed all I can of these, because they are grown on the farm, and are cheaper. But they are deficient in protein, so there is a limit to the amount we can feed.

Now, I keep a book, into which I enter, month by month, on one page, the returns of my dairy, and on the opposite page the cost of the feed, and I am much pleased with the results of my dairy until I turn the leaf and add up the cost of the feed, and subtract that from the returns of my dairy; then I don't feel quite so good. Perhaps you do the same, and I want to see whether we cannot learn to keep that cow a little more economically from the stuff that grows on the farm.

Well, then, we will take the clover, nearly three times as high in protein as the corn stalk, and nearly three times as high as timothy. Now, my friend Wing is here from Ohio to preach the doctrine of alfalfa, and I am glad, because there is about eleven pounds of protein to the hundred pounds—nearly twice the amount as in the clover.

Take next the cheaper grades of bran and middlings, which are upon the market. I agree with Mr. Fuller that the standard of bran and middlings has been raised the past few years. If you will cut your hay when the plant is half in bloom, you will get as much value out of it as from the hay that is allowed to reach full maturity, with a pound of grain per day added. I will stake my reputation on that. You see that I am not recommending anything that will cost a big outlay of money on the part of the average farmer.

Now, what next? We take the Canada Pea. I consider it superior to the clover, and next to the alfalfa, as an economical milk producer. About two bushels of peas and one of oats make a good mixture. But when the oat head is forming and peas are in blossom, what

next? Oats. I know of no feed that will put more stamina into cattle than oats will. They will not produce any more milk, but they will stay longer than wheat bran.

What next? Buckwheat middlings; very little fibre, but very rich in protein, and very rich in fat. Where you are making butter in large quantities, it has a tendency to make a soft butter.

Now, we have got through the list of farm products, but we must have more protein; so what shall we do? Usually we shall have to go out and buy. A man said to me sometime ago, "What is your balanced ration?" I said to him, "I have not got any balanced ration." I am going to buy where I can get the greatest amount of food value for my money. I have been a great stickler for wheat feed, and I have said frequently, because I believed it, that a large portion of our rations should be bran or middlings, because it makes bone. I know now that bran and middlings are not necessary for the cow, and how do I know it? I have eliminated it largely from my list for the last two years, and my cows are just as healthy as they were before. When a man asks me over \$20 for bran, and I can for that money get something that has more protein, I tell him to keep his bran and I will keep my money. What about bone material? If the food is deficient in it, feed a couple spoonfulls of bone meal daily. I find that malt sprouts and brewery grains, which are made from barley, will not hurt the cattle in the least; and these by-products of the brewery are cheaper and better than a like amount of the wheat feeds at the same money.

I don't buy the starch by-products and I need more protein, so what am I going to buy? I don't want to buy crude fibre, and if in some of these mixed feeds, when a man comes to buy them, he finds he is feeding—what did the Professor say this afternoon—20 per cent. I think one of them ran up to 50 per cent. of it, and it is not a notion, but, friends, some of these feeds are 60 per cent. fibre. But I must have more protein, and I will buy where I can get the most digestible material for the least amount of money. I don't know what it will be next year, but I know what it is this year, the brewers' grains, and distillers' grains. A carload of brewers' grain contains twice the amount of the protein and fat as bran; it may not be quite as digestible.

Cottonseed meal at \$30 is not dear when we think it has 40 per cent. of protein and 10 per cent. of fat. Of course, we can't feed that in excessive quantities, but a couple of pounds a day may be fed with profit.

I find that I can get as much milk out of a ton of 20 per cent. gluten as I can out of a ton of cottonseed meal, but if I feed the gluten exclusively, my cows will get thin. Then the linseed meal, very rich in protein and very economical. Prof. Fuller told us this afternoon that some of the stock feeds on the market sold as high as \$160 per ton and are composed chiefly of linseed meal at \$32 per ton. I have never seen the man who denied it, but then, they tell you it is mixed with several expensive drugs. Well, if you want to feed it, I will guarantee this to be as good as the drugs they use:

- 100 lbs. linseed meal.
- 5 lbs. powdered charcoal.
- 5 lbs. Epsom salts.
- 5 lbs. common salt.
- 4 lbs. saltpetre (which they call nitrate of potassium, and we don't recognize it).
- 3 lbs. fenugreek.

You can see how very expensive these things are, and I would say that if the animal is well, I would not give her any of them. Well, friends, there is rational feeding. Now, how much will you feed? Why, we will feed all the animal needs to keep her in good condition and in addition to the course of feeds she has, just as much grain as she will pay a profit on. That depends a good deal on the cow and a good deal on what you are getting for the milk. If you are getting four cents for it, you can feed better than on three cents. It is not "How much milk can I carry away," but "How much have I left for myself?" That is, over and above cost. I think it can safely be put down that eight pounds of grain in addition to the silage and good hay is as much as the average herd will pay a profit on for a daily ration.

But, you ask me, will that ration balance? I don't care a hill of beans whether it balances or not. I have quit sitting up nights figuring on that.

I am going to ask the old cow whether that ration was balanced or not. "How?" you will ask. I put my hand on her skin; if that is soft and oily as it is in summer, when she has pasture grass, she is all right, but if it is coarse and rough, then we put in more protein. Then, her droppings I consider a very important indication. If they are too hard, I would feed her more linseed as a laxative, and if they are too soft, some cottonseed meal, and I don't care whether it balances from one to four or from one to seven; it is all right.

And again, there is a difference in the cows. I find that the Holstein will take a wider ration, with less of the heating elements, than the Jersey. Again, I find that it depends upon the way the cow is kept. A cow that is kept very cold needs more heating feed. You go out here on the Pennsylvania Railroad some day when it is very cold, and you will find that the train is losing time, and the conductor will tell you, if you ask him, that it can't get up steam; the trolley car is making its usual time in the same weather because its power engine is under cover.

We want to calculate by weight and not by quart, and first we must feed that cow so as to keep her in good condition; next, we will feed her for profit and not for production. We will give her the succulent silage, then we will follow with the alfalfa; then we will feed her the coarse feeds we have and to give our animals what they need of protein, we will depend on oats, peas, and home grown feeds, and when we need to buy, we will buy where we can get the greatest amount of protein for the least amount of money, because the cow will be the better for it, and then we will feed her as much as she needs to keep her in good condition, and that will be rational feeding.

The CHAIRMAN: As this is a joint meeting of the State Board of Agriculture, Pennsylvania Dairy Union and the Live Stock Breed

ers' Association, I will now call on Mr. Norton, President of the Livestock Breeders' Association, to take the Chair, and preside over the remaining part of the session.

Mr. Norton thereupon assumed the Chair, and proceeded to carry out the program of the joint meeting as above referred to.

This closes the proceedings of the State Board of Agriculture proper, the remainder of the program being carried out by the Pennsylvania Livestock Breeders' Association and the Pennsylvania Dairy Union, for Proceedings of which address,

E. S. BAYARD,

National Stockman and Farmer, Pittsburg, Pa.
Secretary Livestock Breeders' Association.

or

W. E. PERHAM, Niagara, Pa.,
Secretary Pennsylvania Dairy Union.

A handwritten signature in cursive script, reading "A. B. Britchfield". The signature is written in dark ink and is positioned above the word "Secretary.".

Secretary.



ABSTRACT OF THE PROCEEDINGS
OF THE
FORTY-EIGHTH ANNUAL MEETING
OF THE
STATE HORTICULTURAL ASSOCIATION
OF
PENNSYLVANIA,
Held at Harrisburg, Pa., January 16-17, 1907.



STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA.

OFFICERS FOR 1907.

PRESIDENT.

Gabriel Hiester,Harrisburg.

VICE PRESIDENTS.

Hon. W. T. Creasy,Catawissa.
F. H. Fassett,Meshoppen.
R. M. Eiden,Aspers.

RECORDING SECRETARY.

Enos B. Engle,Waynesboro.

CORRESPONDING SECRETARY.

Wm. P. Brinton,Christiana.

TREASURER.

Edwin W. Thomas,King of Prussia.

PROCEEDINGS OF THE FORTY-EIGHTH ANNUAL MEETING OF THE STATE HORTICULTURAL ASSOCIATION OF PENN- SYLVANIA, HELD AT HARRISBURG, PA., JANUARY 16-17, 1907.

Gauged by the attendance at our sessions, the interest manifested in our papers and discussions and the practical information elicited therefrom, and the large and attractive exhibit of fruits on our tables, this may justly be considered the most successful meeting we have held in a decade, if not in twenty years. It is an evidence of an awaking interest in fruit growing and horticulture in Pennsylvania, which promises to place our own State before many years, where she rightfully belongs, at the head of all others as a fruit producing State.

The following have become members of our association since our last annual meeting.

LIFE MEMBER.

H. C. Cummings, Sunbury, Pa.

ANNUAL MEMBERS.

Banks, William, Mifflintown.	Kready, W. S., Mount Joy.
Barlow, Thos. W., Fort Washington.	Lee, Ross F., Bedford.
Bostwick, D. C., Ripley, N. Y.	Leshner, C. M., Northumberland.
Bretz, Robert, West Fairview.	Lewis, W. J., R. D. No. 1, Pittsburg.
Claar, W. M., Queen.	Martin, Hon. A. L., Harrisburg.
Denning Co., The, Salem, O.	Prickett, Josiah W., Bigleiville.
Fassett, F. H., Meshoppen.	Richardson, F. W., Paoli.
Fenstermaker, P. S., Allentown.	Rinchart, Geo. W., R. D. No. 4, York.
Gass, W. J., Paxinos.	Rumble, W. H., Ringtown.
Geist, C. H., Guernsey.	Ruof, Fred., Hummelstown.
Gross, Joshua W., Harrisburg.	Snively, M. H., Cleona.
Grove, W. E., York Springs.	Stephens, A. W., Lewisburg.
Gump, Dr. S. H., Bedford.	Stroud, J. W., Black Walnut.
Harshman, U. W., Waynesboro.	Thomas, Ernest K., Botanic Garden
Harris, Joseph, Shamokin.	University of Pa., Philadelphia.
Hartman, L. E., Etters.	Tyson, W. C., Guernsey.
Hartley, A. D., R. D. No. 3, Pottstown.	Wood, J. C., Stroudsburg.
Hess, Chas. C., Phillipsburg.	Youngs, L. G., North East.
Jamison, J. E., Swales.	

After the usual preliminary work of calling to order, reading and approval of minutes, and a short recess for payment of dues, President Hiester stated that the election of a committee to nominate candidates for the several offices for 1907, was in order, and the following were elected members of said committee:—Dr. J. H. Funk, A. I. Weidner, D. L. Hartman, D. M. Wertz and F. H. Fassett.

The committee was instructed to nominate candidates, and report at the morning session.

In the absence of Chairman R. L. Watts, Mr. D. K. McMillan, read the following:

REPORT OF THE GENERAL FRUIT COMMITTEE.

In presenting a report of the General Fruit Committee, the Chairman wishes to thank the correspondents throughout the State for their prompt and very necessary assistance. It is hoped that the report will not only relate to the results and progress of the past year but will also be an index, to some extent at least as to the general trend of fruit culture and gardening in Pennsylvania, and the possibilities for extended operations in every county. There may be over-production some years in a few sections but the possibilities of the State as a whole are almost unlimited for the production and profitable disposition of first class fruits and vegetables.

APPLES.

The apple is without doubt the most important fruit crop in Pennsylvania. It is grown in every county for home consumption and grown in every county to a greater or less extent for commercial purposes. It well deserves the study and attention of practically all our land owners and it is destined to occupy a much more important place in the horticulture of our State. Some sections are much better adapted to this fruit than others and the industry is developing rapidly in some of these favored locations. There are hundreds and hundreds of acres, however, where soil and climatic conditions are well adapted to the apple and where no special attention is given this fruit. The apple industry should be developed in these sections.

The 1906 crop was above the average in yield. Quite a number of counties report very large or full crops. A good crop is reported from many counties and correspondents in very few counties report less than an average crop. The yields in the greatest apple producing counties as Adams, Franklin and York was not above the average and a number of growers report very light crops. The quality of the crop in most sections was above the average being very good in many counties. Only six correspondents report a crop of poor quality.

In reply to the question, "Is the crop profitable in your county?" only two correspondents give negative answers. This almost unanimous affirmative answer indicates in a very positive way the great possibilities for apple culture in Pennsylvania. Unfavorable weather conditions, particularly late spring frosts, were the direct causes of failure in some orchards the past year, but the trouble on too many

farms arises from negligence. We cannot expect to get paying crops of choice fruit without intelligent and persistent work in the way of tillage, pruning, fertilizing and spraying. The San José Scale is a serious enemy to our orchards and this pest must be fought, but spraying alone will not procure good fruit. Two-thirds of the correspondents indicate that apple trees in their respective counties are dying rapidly and it is doubtful whether the San José Scale is so much responsible for this loss as some other factors, particularly the lack of proper fertilizing and the failure to cultivate or mulch.

The consensus of opinion regarding the five most profitable winter varieties is as follows:—Baldwin, York Imperial, Northern Spy, Rhoad Island Greening and Ben Davis. Staymans' Winesap, which is receiving so much attention at the present, is reported as one of the five best varieties by correspondents in Berks, Lancaster, Chester, York and Franklin counties. Reports show that commercial planting is largely on the increase in Pennsylvania.

PEARS.

The 1906 pear crop was fairly encouraging. Only a very small percentage of the correspondents report a full crop and 25 per cent. report a fair crop. The crop was light in most counties although the quality was above the average. Commercial planting is very evidently on the decrease in most counties. To every grower reporting an increase in pear planting, four report a decrease. Blight is by far the most serious enemy to the pear and the reports show this in the most emphatic way. The discouraging phase of this subject is that science is giving us practically no new light relating to the combat of the disease. It is the great barrier to pear culture and few large plantations will be made until more is known regarding its control. As to varieties, Bartlett and Kieffer are the leading commercial varieties grown in the State. Seckel, Clapp's Favorite and Duchess receive favorable mention quite frequently.

PEACHES.

The peach crop was very light in most of the counties. Absolute failure is reported from many of the colder counties of the State, while a medium crop was harvested in the more favorable central counties. Lehigh and some of the south-eastern counties produced large and satisfactory crops, especially in Franklin, Montgomery, Lancaster and Chester counties. Weather conditions were not favorable in most of the counties. In a number of counties winter freezing destroyed the fruiting buds and late Spring frosts added to the work of destruction. The San José Scale, "yellows" and borers are universally recognized as the most serious enemies. Peach culture is regarded as decidedly profitable in the State where prevailing natural conditions are favorable.

PLUMS.

The 1906 plum crop in Pennsylvania was far from being a success. Only four counties report a large crop, namely, York, Lancaster, Montgomery and Lehigh. In every other instance either a light crop is reported or a total failure. Unfavorable weather conditions as severe winter freezes, late Spring frosts and wet weather de-

creased the yield in some counties, while diseases and insects were more generally responsible for the light crop. The consensus of opinion is that the curculio is the most destructive insect pest to plums and the San José Scale takes second place among the foes. Abundance, Burbank, Lombard and German Prune are the most popular and profitable varieties grown in the State. But there seems to be very little interest in commercial plum growing and very few trees are being planted with a view to supplying fruit for market purposes.

QUINCES.

According to reports of our correspondents the outlook for quince culture is no more promising than a few years ago. Our Lancaster county correspondent thinks the outlook is encouraging in that county, but no other grower takes an optimistic view of the question. The most serious obstacle to quince culture is twig blight.

CHERRIES.

Cherries are quite universally grown in Pennsylvania and a large majority of the correspondents state that the crop is grown profitably in their respective counties. It is especially successful in most of the more hilly counties where the climate is not too severe, and the industry should be developed in these favored localities. The sour cherries, such as the Early Richmond, may be produced and is produced under a great variety of soil and climatic conditions but this is not true of the varieties producing the largest and finest sweet cherries. The finest large sweet cherry requires a peculiar fitness of soil and climate and the area of our State where such a combination is afforded is rather limited. The industry deserves special attention in these communities. A neighbor in Cambria county grows as fine Windsor cherries as were ever grown in California, and the quality or flavor surpasses the California fancy cherries. The following varieties are most largely grown in our State: Early Richmond, Black Tartarian, Gov. Wood, Montmorency Large, English Morello, Dyehouse, Yellow Spanish and May Duke.

GRAPES.

Commercial grape culture in Pennsylvania, is confined almost entirely to Erie county. There are isolated growers here and there in various parts of the State who grow considerable quantities of grapes for market, but most of our farmers and horticulturists are interested in the production of this fruit for home consumption. The grape is certainly one of the most delicious and refreshing of all our fruits and every farm should contain at least a few vines. Concord will give fair results in almost any soil, while there is an extensive list of varieties which will do well over a large part of our State. The following varieties are especially desirable, according to the views of the correspondents: Concord, Niagara, Brighton, Delaware, Moores Early, Worden and Brilliant. The Chairman of this committee, who has fruited the Brilliant, is particularly impressed with the fine quality of this grape. It is a cross between the Delaware and Brighton with the size of the Brighton and the quality of the Delaware.

SMALL FRUITS.

Over half the correspondents report that small fruit culture is on the decrease in Pennsylvania. This is a deplorable fact and it is hoped that new interest will be taken in small fruit culture during 1907. The following varieties of strawberries are mentioned the most frequently as being the best: Bubach, Gandy, Wm. Belt, Sharpless, Brandywine, Warfield, Haverland, Glen Marr, Tennessee Prolific, Sample and Senator Dunlap. Cuthbert stands very much in the lead as the best red raspberry and Gregg occupies first place among the black caps. Cumberland is coming to the front rapidly and is now quite generally grown in the State. Kansas, which was so popular a few years ago is mentioned by only three correspondents. Snyder is regarded as the most profitable blackberry, followed by Erie, Kittatinny, Taylor and Ancient Briton.

VEGETABLES.

Trucking or market gardening is profitable in Pennsylvania, wherever desirable markets can be found. The crops which may be grown on the greatest variety of soils are generally recognized as the most profitable. The following vegetables are favorably mentioned the most frequently: Cabbage, tomatoes, potatoes, onions and celery. A distinctly sandy soil, which is necessary to follow a general line of trucking, is not required to grow any of the foregoing vegetables, and it is surprising that scores of our markets are poorly supplied with home grown produce. Almost every correspondent speaks of the opportunities in his county for market gardening.

SPRAYING.

At least 80 per cent. of the correspondents report that spraying for insects and fungous diseases is on the increase. This is the most encouraging part of the communications which the Chairman of this committee has received. It is an assurance of better days in the future, for those who have been spraying with care, thoroughness and intelligence have been well rewarded for their work. In reply to the question "What are the results of spraying?" we note these answers: "good", "very good", "fine", "satisfactory", "excellent", "holding scale in check", etc., etc. Of course some have been disappointed, but failure in most instances has been due to improper insecticides or fungicides or faulty methods in their application.

THE SAN JOSE SCALE.

There is no doubt about the San José Scale being spread quite generally over the State. Some growers report that they do not know of its presence in their counties but the investigations of Prof. Surface and his assistants show that there are comparatively few sections where this pest does not exist. That it is very much more prevalent in some counties than others is well known by the immense losses which have been sustained in these scale swept counties.

Very little is being done to control the scale where the damages have not been especially noticeable. These localities need a warning that the fruit growers or farmers will not forget, for certainly preventive measures should be taken before the scale gains a strong

hold. When isolated trees are found which are badly infested the best thing to do is to destroy them as soon as discovered.

The question as to the best spraying material to use is yet unsettled in the minds of many orchardists. It is quite generally agreed among the entomologists of our country as well as among many practical fruit growers, that the lime and sulphur spray is the most effective of all applications, and it is most extensively used in Pennsylvania. And yet some of the commercial preparations are attracting great attention and well deserve the consideration of both practical and scientific men. The soluble oils, particularly "Scalecide," has been found very effective in the hands of a few of the leading members of the Pennsylvania Horticultural Association. Our Secretary, Mr. Engle, reports favorably concerning the value of "Scalecide" and "Target Brand." Mr. J. H. Ledy, of Franklin county, has been well pleased with the effects of the soluble oils. Mr. Henry T. Moon, of Bucks county, says "Scalecide" is excellent and Joseph W. Anderson, of York county reports that "Scalecide has given better results than lime, salt and sulphur. In connection with these statements the fact should be emphasized that lime and sulphur or lime and sulphur with salt added is giving excellent results in our State and elsewhere, where pure materials are used, boiling and mixing properly done and the application thorough.

COMMERCIAL FERTILIZERS.

Commercial fertilizers are used quite extensively by the fruit growers of our State and where used intelligently the results have been highly satisfactory. There is a wide difference of opinion as to the best formula for each particular fruit. One grower claims that a fertilizer containing not less than 15 per cent. of potash should be employed for apples on his soil, while another advocates only 2 per cent. of potash. The question of what to use and the proportion of the various elements is largely a local question with each grower and it is practically impossible to find on the market those brands of fertilizers which are best adapted to the various soils and fruits of our State. This renders home mixing highly desirable, for it gives the grower absolute control of the whole question. He can mix the food to suit the land as well as the crop, and actually save from five to ten dollars per ton. Home mixing has also a decided educational value which should not be overlooked.

TILLAGE.

The reports of our correspondents on the subject of tillage are very interesting. Little attention is given our general farm orchards in the way of cultivation, for the trees usually stand in sod and the results are far from satisfaction in most cases. Then there is quite a large class of commercial fruit growers who are very rigid in their ideas, that thorough tillage should be given all orchards, maintaining the supply of humus by the use of manure, or more commonly by the use of cover crops, preferably legumes, as the red clover or crimson clover. This method finds little criticism for it not only secures good fruit, but also keeps the soil in a fertile condition. Quite a large percentage of our correspondents this year report excellent results from mulching, particularly when the trees

are young, and when in bearing, too, if the necessary mulching material can be procured. Mulching is especially desirable for rough, hilly lands which cannot be cultivated without serious loss by washing. It is a question whether mulching material could not be bought, if necessary, and applied on level lands cheaper than by continuous cultivation followed by green manuring. It is quite generally conceded that peach orchards should receive thorough cultivation.

SCHOOLS.

It is gratifying to report that nature study is receiving increased attention in the public schools and that elementary agriculture is taught to a slight extent. The school grounds are better cared for than formerly and these are all positive indications of progress in the rural communities. Although good work along these lines is being done, it is purely voluntary on the part of the teacher and no particular influence is brought to bear on school teachers to show how necessary it is to country life. We cannot expect many of our boys to become farmers and practical horticulturists and to find real joy and happiness in their work unless they are taught concerning the beauties and mysteries that surround them in their every day life and know something of the fundamental principles of agriculture and horticulture.

R. L. WATTS,

Chairman, General Fruit Committee.

(The discussion following this report is omitted for want of space.)

WEDNESDAY JANUARY 16.—EVENING SESSION.

Having called the meeting to order, President Hiester, referred briefly to the "Question Box" on the Secretary's table, and reminded the members that it was their privilege to use it.

ANNUAL ADDRESS OF THE PRESIDENT.

I think we have good cause for congratulation on the very substantial progress we have made along all horticultural lines during the past year. Several new County Societies have been organized by men who show considerable enthusiasm in the work and I have no doubt good reports will come from them in the near future—of the older County Societies, the Wyoming County Association has arranged for the planting of a large commercial apple orchard by a company composed of some of its members, and a few Philadelphia capitalists who are engaged in selling fruit in that city. The members of the Adams county society conducted a very careful line of experiments for the suppression of San José Scale in their several orchards, and compiled an accurate report of the results. This report was considered of such importance by Secretary Critchfield, of the State Department of Agriculture, that he has secured a copy, which he will print in his annual report and send broadcast to the farmers of the State for their instruction,

Insect pests and fungus diseases were unusually troublesome during the past year, but our people have advanced in their knowledge and are better able to control them than ever before. The State Department has kept a large force of experts at work in the different counties of the State, giving spraying demonstrations, while the owners of proprietary mixtures have also had their agents out among the farmers instructing them and assisting them in their work. Nurserymen as a rule have complied with the terms of the fumigation law. The trees sent out have been carefully fumigated, and being clean when planted will be much more easily kept clean than unfumigated stock. Taken altogether, I think our orchards are in much better condition to-day than they were this time last year.

But a careful examination of the fruit on the table before us will bring to light the fact that we still have much to learn. That fine collection, which represents the best product of many of our most careful growers—shows on many specimens the marks of San José Scale, and sooty spot fungus. Our scientific men will do well to study that fruit carefully. We have done the best we can with our present knowledge. We ask your aid in discovering more positive remedies for these troubles. One of the most promising events of the year was the passage of the Adams Bill by Congress, this bill practically doubles the appropriation for Experimental Stations by the U. S. Government. This will allow our station to diversify its work, to start a series of horticultural experiments that will be of great service to the fruit growers of the State. We were all glad to learn that the Trustees of State College had secured the services of Dr. Thomas F. Hunt, of Cornell, as Director of the Experiment Station and Dean of the School of Agriculture. He comes to his new position fully impressed with the importance of the fruit industry in Pennsylvania, and admirably equipped for the work. I ask for Dr. Hunt, the hearty support and co-operation of every member of this society.

The new German tariff law provides a maximum duty of \$1.65 per bbl. on apples, and a proportionately high rate on dried apples, for all countries that do not comply with certain conditions before July 1st. A bill has passed the House and is now before the Senate which does not provide for such a treaty of commerce as would secure for us the minimum duty of 50 cents per bbl. Unless this bill is so amended as to comply with the requirements of the German Government before July 1, 1907, we will have to pay the maximum duty of \$1.65 per bbl. and would simply be prohibition. This may seem a small matter to some of us who always sell our fruit in a near local market, but we must remember that large commercial orchards of York Imperial apples have recently been planted in certain sections of this State. That York Imperial apples sell at a higher rate in the German markets than in any other foreign country, consequently if we loose the German market we loose the best foreign market for Pennsylvania apples. I would suggest that the Legislative Committee take up this matter and prepare proper resolutions to be presented before the close of this meeting.

To the delegates from other societies who are with us, I extend on behalf of the society a most cordial welcome, we are glad to have

you with us, we hope you will feel perfectly at home, and taken part in all the discussions. We want you to have a good time and to carry away with you only pleasant recollections.

COMMERCIAL FRUIT GROWING.

PROF. G. F. WARREN, Cornell University, Ithaca, N. Y.

Mr. President, Ladies and Gentlemen:—This subject is one that I prefer to present with lantern slides. Since we do not have a lantern here, I will call attention to a few points on this subject and then take up a discussion of tillage of apple orchards.

Pennsylvania's Rank in Horticulture.—Commercial fruit growing is a good subject for an address in Pennsylvania because this State has always been the second or third in the Union in fruit production. I wonder if you realize how important a place it occupies. It is well for us to stop and take an inventory of ourselves occasionally. We have no later figures on fruit crops than the last census and there has been a great increase since then. At the time of the last census Pennsylvania ranked among the states: second in apples, third in all orchard fruit, fourth in grapes, sixth in nursery products and seventh in small fruits. The total fruit products for the census year 1899 were \$10,500,000.00. It stood second in total vegetable products with a value of \$16,000,000.00.

The total horticultural products, not including flowers and seeds and greenhouse products of this State were, therefore, \$26,000,000.00. The present product is certainly much above these figures. Pennsylvania is, therefore, third in horticulture being exceeded by California and New York. Nearly one-fourth of all the crops of Pennsylvania are horticultural crops (22 per cent.).

In spite of scale, codling moth, scab and all the other enemies that must be controlled, I feel sure that this position will be maintained for many years. No state except New Jersey has a better situation with reference to markets. This position together with favorable soil and climate, certainly calls for an increase in fruit growing, so that just now when so many men are discouraged on account of scale and other difficulties seems to me to be the best time for entering the fruit business provided it is undertaken in a business like way.

Danger of Over Production.—But can we compete with the West? And is there no danger of over production? In 1850 the average value of fruit produced in the United States was 33 cents for every person. People who bought the fruit paid more, but the average value at the farm was 33 cents for every person in the United States. In 1900 the amount was \$1.11 for orchard fruit and \$1.74 per capita for all fruit, or four to five times as much is being spent by each member of our population as was spent 50 years ago. On the average, the amount spent per capita has increased about 30 per cent. every ten years. Can we say that this increase is now going to stop? Can we say that the American's desire for fruit has reached its

limit when he buys \$1.74 worth per year? (He probably pays double this when transportation and commissions are added to these farm values.)

Value of Fruit as Foods.—Fruit is usually spoken of as a luxury and is said to have little food value except as a tonic, to be taken much like peruna and apple jack, because we like it. The public is coming more and more to recognize fruit as a necessity. Fruit probably has a great value in keeping the system in condition to digest other food but fruit growers have generally underestimated the value of fruit as a direct food. It is their province to educate the public as to its food value. A pound of grapes contains as much total digestible nutrients as a pound of potatoes. Apples contain two-thirds as much as potatoes and twice as much as squash. You can frequently buy a pound of digestible food in apples as cheaply as in potatoes. The kind of food is somewhat different, the fruits being lower in protein.

Development of Commercial Fruit Growing.—I believe that the wonderful growth in the consumption of fruit in the United States has not yet reached its limit. We have hardly begun to produce fruit as a business. A large part of our present fruit is grown by men who care for the corn crop first. These men are corn growers, not fruit growers. But there is developing a class of men who make fruit growing their business. In times past we grew fruit for the kitchen; it was primarily for home use. Our fathers planted one or two acres of apples, and set them on land least suited for growing grain or around the house where they would be handy. If the orchard produced enough for the winter's supply and for cider they were satisfied. They had no particular quarrel with the codling moth. This gave more cider apples, and sometimes the farmer was perfectly willing to have more cider and fewer baked apples. You all remember in your boyhood days when you went to certain trees for your eating apples—and what apples they were! Better than any that grow today—because you were the boy with a boy's appetite. You selected only the best that were left after the worms and disease had taken their share. We may remember the enormous yields that some tree gave some year, but generally the trees were not held to a strict accounting. These old orchards were made up of many varieties. A variety for every day in the year was sometimes considered ideal.

A very large number of these old orchards are still in our State, in fact they are still in the majority, but they are disappearing. The sooner they are gone the better for our fruit interests. They furnish breeding places for insects and fungous pests, and when they do give the owner a crop that he has never earned they interfere with the sale of a better product.

The growing of fruit as a business, as many men are now coming to grow it and as more will do now that we are getting adjusted to the new conditions, is entirely a different proposition. Now our fruit farms are manufacturing plants—they must produce enough to pay dividends; but we are not satisfied with a profit, we want the best profit, and if there is any way of getting more profit the question is well worth considering.

The tendency is to get this greater profit by higher care in every detail, but we are not wholly adjusted to the new conditions and

there continually arise discussions of easy ways and so-called "nature's ways." Many men believe that apple trees should not be pruned because this is "nature's way." But nature prunes and prunes severely. The limbs fight it out among themselves. Gradually some limbs are killed and those that persist are injured by the combat.

Then another man says that nature's way is to have sod in the orchard. Now the real natural way is to have the trees growing close together, each one trying to crowd the other out, so that the trees become like forest trees, with a bouquet of leaves at the top. One noted advocate of the sod mulch method has an orchard on the side of a hill. As the water sweeps down this hill it gives him an excess of moisture. He uses the grass to pump this excess of water out, but many farmers, seeing this easy way advertised, take it up wholly regardless of their soil conditions.

A man in the South found that he could cut all the roots from a tree before setting and get good results. Being an advertiser his method became widely known and many men in the North adopted it. Where he lives the spring comes on gradually, so that the tree can become rooted and may be fairly successful, but with us we have the "burst of spring;" suddenly a great demand is made on the roots and the tree thus treated generally fails to do as well. Practically all Experiment Station tests have condemned the method.

So we have many men of many minds as we are changing from old conditions to the commercial orchard ideas. The man who originates the fad or who actively champions it is usually successful, because his pride causes him to treat his trees so well in all other respects. Not infrequently his success is in spite of, rather than because of, his fad. Many of these ideas are based on attempts to get back to nature's way. While we need to understand nature, yet it is largely in order to know how to improve her ways or to avoid them. Nature grows fruit for the seeds; her purpose is to produce apple seeds, and these with little pulp. But we want pulp and as little core as possible. Her way is to grow a multitude of small apples, while our desire is for a smaller number of large ones.

TILLAGE OF APPLE ORCHARDS.

In the summers of 1903 and 1904 Mr. Bues and I made an orchard survey of Wayne and Orleans counties, New York. These are two of the four lake counties in the noted apple region of Western New York. Each county produces about 4,000,000 bushels of apples in a year when there is a fair crop. Over 1,100 orchards were examined, whose total area was nearly 9,000 acres. Each orchard was examined for diseases, insects, character of soil, drainage, varieties, methods of pruning, tilling, fertilizing, spraying, etc., and the yields were obtained. The effort was to study everything that had to do with success in apple production. That is, to study the results of seventy-five years of apple growing.

When you examine only one orchard you can not tell what is the cause of success or failure, because there are so many factors that enter into the question. By examining a large number and tabulating the results it becomes possible to determine the relative import-

ance of the many questions that are concerned with success in apple production.

We found that tillage had more influence on yield and income than any other question. Spraying was generally second in importance, but in some years it took first place.

In the township of Walworth, in Wayne county, every orchard as large as one acre was examined. Table I shows the yields of the tilled and sod orchards for the years 1902 and 1903.

TABLE I.

Average Yield in Bushels of Tilled and Untilled Orchards, Walworth Township, Wayne County, New York.

	1902.			1903.		
	Number of orchards.	Number of acres.	Average yield.	Number of orchards.	Number of acres.	Average yield.
Till 5 years or more,	42	304	301	27	293	255
Tilled most years,	59	221	265	29	86	274
Sod most years,	69	306	227	119	119	261
Sod 5 years or more,	79	295	202	124	124	268

The entire county was examined in the same way, except that only the larger orchards were taken in the remainder, usually those containing about ten acres or more. The four-year averages for the county are given in Table II. This shows that the tilled orchards averaged about 80 per cent. larger yield than the untilled. A part of this great difference is doubtless due to other factors. The man who regularly tills his orchard is more likely to fertilize, prune and spray well. To see how much of this difference is due to tillage and how much is due to other factors another classification was made. This is shown in the second column, well-cared-for orchards. All these have received some fertilization, have been fairly well pruned, are not diseased or in bad condition from any causes. Of these well-cared-for orchards the tilled ones gave an average of 35 per cent. above the untilled. This tabulation doubtless gives too high a yield for the orchards in sod, for in making it all diseased ones were thrown out. In many cases these should have been included, for the disease frequently gets a foothold because the sod has lowered the vitality of the trees. The real difference due to sod will therefore lie between the 80 per cent. shown by the first column and the 35 per cent. shown by the second column.

TABLE II.

Yields in Bushels per acre of Tilled and Sod Apple Orchards, Wayne County, New York. Four-Year Averages, 1900-1903.

	All Orchards.			Well-Cared-for Orchards.		
	Number of orchards.	Number of acres.	Average yield.	Number of orchards.	Number of acres.	Average yield.
Tilled 5 years or more	38	329	266	27	275	271
Tilled most years,	11	193	229	26	182	245
Sod most years,	13	312	202	28	235	206
Sod 5 years or more,	71	675	118	31	242	209

A similar study was made in Orleans county. Table III, shows the five-year average yields for this county. Those that have been tilled ten years gave 86 per cent. higher yields than those that were

TABLE III.

Yields in Bushels per Acre and Income per Acre of Tilled and Sod Apple Orchards in Orleans County, New York. Five-Year Averages, 1900-1904.

	All Orchards.				Well Cared for Orchards.			
	Number of orchards.	Number of acres.	Average yield.	Average income per acre.	Number of orchards.	Number of acres.	Average yield.	Average income per acre.
Tilled 10 years or more,	18	151	327	\$132	16	139	337	\$189
Tilled 5 years or more,	17	142	271	158	3	79	296	148
Tilled most of 5 years,	59	597	225	113	42	241	234	121
Sod most of 5 years,	108	974	122	107	75	648	122	118
Sod 5 years or more,	35	329	204	108	23	197	197	124
Sod 10 years or more,	48	494	176	87	25	294	122	117

in sod ten years, and those tilled five years gave 34 per cent. higher yield than those in sod five years. As in Wayne county, the tilled orchards have undoubtedly fared better in general care. Neglected orchards are likely to be in sod. To eliminate other factors, another computation was made as in Wayne county. In this all neglected orchards were thrown out. This excluded about half the orchards that were regularly in sod and excluded some from all classes. These well-cared-for orchards have all received some fertilization and some spraying; none are badly damaged by lack of fertilization, spraying or drainage, or badly damaged by diseases or other causes. Of these orchards those that have been tilled ten or more years gave 45 per cent. larger yield than those that had been in sod ten or more years, and those tilled five or more years gave 15

per cent. larger yield than those in sod the same period. This tabulation gives too favorable a showing for the sod orchard, for some of the diseased ones thrown out were diseased because of the sod treatment. The real difference lies between the differences shown by the two columns.

Does it Pay to Till?—The complete report of the work is given in Cornell bulletins 226 and 229. It shows the same differences for each of the years and for each of the parts of the counties. Only the summaries are given here. These tables are not theory—they are facts. However we try to explain away the results, we must accept the fact that for some reason the average sod orchard in these counties gives only a little over half as much fruit as the tilled ones.

The difference in income shown by Table III. are even more striking than the differences in yields—a difference that will pay for tilling the orchard, for the loss of pasture and still have a very wide margin of profit. If there is a method of sod treatment that equals tillage we must admit that the average grower has not yet found it.

These tables do not show that every sod orchard should be tilled, but they do show that it would pay to till the average one. If a sod orchard is giving good yields, and if the trees are making sufficient growth to keep up their vitality it may be desirable to keep it in sod. A few sod orchards are as good as the average of the tilled ones, but very few indeed are among the best orchards. By the liberal use of barnyard manure an orchard may be kept in good condition without tillage. But this is usually too expensive a practice. The same results may be accomplished with much less manure if the orchard is tilled. If an orchard is in sod and is not yielding well, or if the trees are losing their vitality, even if the yield is still good, it will probably pay well to till. One of the greatest differences between tilled and sod orchards is in the length of time that the trees keep their vitality. Whatever the best method of treating an old orchard, there is no doubt about the advisability of tilling young trees.

Methods of Sod Treatment.—Of the various methods of sod treatment, pasturing with hogs or sheep gave the best results, as shown by Table IV. One reason why the results with hogs shows up so well is that many of the orchards so treated were really tilled orchards—tilled by hogs. Another reason is that hogs receive much of their food from outside of the orchards, so that there is a constant addition of plant food to the soil. We hear considerable about the so-called sod-mulch method of cutting the grass and throwing it around the trees. But there are few nature orchards in which enough grass can be grown to furnish efficient mulch, even if the method is otherwise desirable.

TABLE IV.

Yields per Acre of Orchards Receiving Different Kinds of Sod Treatment.

	Wayne County 1902.	Orleans County, Three- Average 1902-1904.
Tilled 5 years or more,	317 bushels.	350 bushels.
Sod, hog pasture,	271 bushels.	312 bushels.
Sod, sheep pasture,	216 bushels.	308 bushels.
Sod, not pastured,	188 bushels.	217 bushels.
Sod, cattle pasture,	159 bushels.	153 bushels.

Theory of Tillage.—What I have been giving are facts. The figures are the yields actually secured by farmers. There can be no question about them. When we try to explain why these figures are as they are, we enter the field of theory. We often fail to distinguish between theory and fact. Very often we hear a man start to give his "experience" in fruit growing but spend all his time on theories. Evidently the average sod orchard in Western New York does not yield as many apples nor as valuable apples as the tilled one. This is the proved fact. Why this is the case no one can positively say.

Grass may harm the trees in one of four or more ways: 1, by exhausting the plant food; 2, by exhausting the water; 3, by unfavorably influencing the living organisms of the soil; 4, the grass roots may give off some substance that is harmful to trees.

It is probable that the injurious effects are sometimes due to one, and sometimes due to a combination of several or all of these causes. If plant-food is the chief factor, then the soil that is rich in plant-food may be able to produce an excellent crop of apples and also grow grass. So the water factor may be eliminated on some soils that naturally have too much water. Such orchards may be better if left in sod. Other orchards may be on land that is too stony for tillage or on hillsides that are too steep for tillage. By pasturing an orchard the plant-food is mostly retained and the moisture is probably less exhausted. Barnyard manure may sometimes counteract all four of the suggested ways in which grass may injure an orchard. Whether an individual orchard should be tilled or not depends on many questions. But there is little doubt but that most orchards should be tilled.

The time to till an orchard is as early as the ground is fit. If tillage is begun early and stopped early many of the undesirable effects of tillage may be lessened. At New Brunswick, N. J., last summer we measured the growth of twigs about every two weeks. Half of the growth of twigs, of trees was completed by the middle of May and four-fifths by the middle of June. The best time for tillage seems to be to begin as early as the ground is fit and stop early in July. Then seed to some cover crop or let the weeds grow. The condition of the weather and of the crop will of course have to be considered.

Some men fear that tilling too early will start the fruit buds so that they are likely to be injured by frost. Last winter we tried this at the New Jersey Station in the following manner. A peach tree was so arranged that its roots were in a greenhouse that was growing tomatoes while its tops were outdoors in January weather. At the end of a month the top was brought into the house. It blossomed in a short time. The warming of the soil had no harmful effect on the buds.

Effect of Tillage on Quality of the Fruit.—Apples from sod orchards are frequently more highly colored than are those from tilled orchards, but are not necessarily so. Tillage may make it a little more difficult to secure good color, but there were many sod orchards that gave highly colored fruit. The trees in a tilled orchard must be pruned more openly and fertilized with less nitrogen than is given to orchards in sod.

Many farmers think that apples from sod orchards have the bet-

ter flavor. If this view is correct, the difference is certainly not very great. I once made a test of the flavor by passing out a lot of Baldwin apples to a society. Each member tested two or more and recorded the number of the one that he thought best. The apples were numbered so that the members did not know which ones were from sod orchards. When I came to sum up the results there did not appear to be any decided vote in favor of either kind.

There is also a common opinion that apples from sod orchards keep better. This is probably sometimes true. The larger apples from the tilled orchards are not likely to be quite as firm, but this larger size is a desirable feature and may offset any inferiority in keeping. Apple buyers frequently discuss the question, sometimes favoring one kind of treatment and sometimes the other. But more conclusive than their discussions or than farmers' opinions are the actual prices paid. It will be seen by Table III that the tilled orchards exceed the untilled by a larger per cent. in income than in yield. That is, the average price per bushel is higher from tilled than from sod orchards.

I do not wish to convey the idea that tillage is the all important question in orcharding. It is one of a number of essentials. One-eighth of the trees in these counties were killed and one-fourth damaged by lack of drainage. Too close planting has seriously damaged large numbers of orchards. Lack of fertility has damaged others. In 1904 in Orleans county the unsprayed orchards averaged \$92 per acre in income, the ones sprayed three times averaged \$139 per acre. Proper packing and marketing are other vital points. The ultimate death of nearly all apple trees in New York comes from improper pruning. The decayed trunks and consequently broken trees are usually the result of the system of pruning and the neglect of wounds. All these and more are the factors that enter into successful fruit growing.

THE PRESIDENT.—I am sorry we cannot give you time to question Professor Warren just now. We are going to go through with our program, and if you have any questions to ask, we will give you an opportunity to take up the subject later.

Just now, I am going to do something not on the program. I want every one to recognize Doctor Hunt when they see him. I want you to know him, and I am going to ask him to come to the platform, and say a few words as to what our experiment station is going to do for us.

HORTICULTURE AND FORESTRY IN PENNSYLVANIA

By DR. THOMAS F. HUNT, Director Pennsylvania Experiment Station and Dean of School of Agriculture, Pennsylvania State College.

Naturally, when I was invited to come to Pennsylvania as the Dean of your School of Agriculture and as Director of your Agricultural Experiment Station, I asked myself what are the large problems. The general problem is to create wealth and improve citizenship through the agency of these two institutions. How was it to be done? What are the wealth-producing factors with which I must deal?

Pennsylvania, in common with the other North Atlantic States, is especially adapted to the growing of trees and grass. Pennsylvania and New York together produced in 1905 one-sixth of all the hay raised in the United States. The cultivated area in Pennsylvania devoted to all crops of all kinds except grass is less than one-fifth of the total area. About one-fourth the area in farms is in cultivated crops, other than hay, about one-fourth in hay; the rest must be in pasture or timber or be absolutely waste land. Much of the lumber area is probably under present management even prospectively unproductive, notwithstanding the fact that both the consumption and the price of lumber are increasing at the rate of 3 per cent. a year. Pennsylvania produces 1.5 tons of hay for each animal of 1,000 pounds; Illinois produces three-fourths of a ton of hay for each animal. Illinois produces 4,800 pounds of concentrates to feed with this three-fourths of a ton of roughage, while Pennsylvania produces 1,600 pounds of concentrates to feed with 1.5 tons of roughage.

Trees not only create forestry, they also create horticulture. The reason that Pennsylvania and New York are the two largest horticultural states, citrus fruits excluded, is because they are tree states. Only those who have studied the tree growth in the states, westward of Pennsylvania to the Rocky Mountains, can realize the difference in the vigor of all tree growth. In Illinois, Ben Davis apples come into bearing at five years of age. When I went to New York, I was told that Baldwin apples came into bearing at fifteen years of age and I asked how long the trees lasted. They said they did not know, that they had not been raising them long enough to find out, but that they had trees 100 years old in full bearing.

The fundamental proposition I lay down for Pennsylvania agriculture, (using the word 'agriculture' in its broadest sense), is that the State is especially adapted to the raising of trees and grass, and that all agricultural industries based upon trees and grass will flourish and should be developed. Next week I expect to say something before the State Breeders' Association about the development of the industries which are based upon grass. To-day I confine myself to the development of the industries based upon trees.

Recognizing that in Horticulture Pennsylvania had an important industry requiring expert knowledge and skill, I looked around to see what agencies The Pennsylvania State College had for developing it. I found that the institution had one very worthy but underpaid Professor of Horticulture and an assistant who had been working there for twelve years for a thousand dollars a year. The numerous letters of inquiries upon horticultural subjects, which are being received constantly, have to be answered by hand. When I came to inquire into the money required to maintain the instruction and research, I found that it was so small it could scarcely be calculated. There was no adequate agency for studying the fungous diseases and insect enemies which form so large a part of the problems of the horticulturist. Less than four thousand dollars was spent for salaries and maintenance for instruction and investigation in horticulture and none at all for investigations in fungous diseases and insect enemies.

I at once prepared a budget for the Executive Committee in which I recommended the establishment of two departments of horticulture; one to deal with fruit raising and vegetable gardening, and the other with floriculture and landscape gardening, and that a Department of Forestry be created. For these three departments the budget sets aside for salaries and maintenance \$15,200.00 for the fiscal year 1907-08 and \$18,700.00 for the fiscal year 1908-09.

I expect the heads of all these departments to say that this is not enough money. Already the head of one of them has served notice upon me that unless more money is forthcoming for his department than I have provided in the budget, that he will not accept re-appointment. I think he is right, but it is so much more than nothing that I had not dared to ask for more. The budget also provides for the employment of a botanist who will give his whole time to the study of fungous diseases injurious to orchard, garden and field crop, and for a Professor of Zoology and Entomology who shall give at least a part of his time to the investigation of economic insects. Coupled with the recommendations concerning the budget was a recommendation for a building for horticulture, forestry and entomology at an estimated cost of \$100,000.00. This is to be a building about the size of the new Dairy Building and to have sufficient greenhouse space for investigations in horticulture, fungous diseases, economic insects and for instruction in horticulture. If students are to be taught horticulture in this climate between October 1st and May 1st in a real, vital way, and not merely academically, then glass houses must be provided.

I should, perhaps, pause here long enough to say that all these recommendations have been most heartily endorsed by the Executive Committee of the Board of Trustees of The Pennsylvania State College.

I should also add that the lack of attention to horticulture upon the part of the Experiment Station has been due to the settled policy long ago established by the Board of Trustees to apply the limited funds of the Station to investigations in Animal Nutrition and Dairy-ing rather than trying to spread the activities of the Station over a wider field than the funds would warrant. Conditions are now such in this State that money should be forthcoming to study the horticultural problems of the State.

In looking into the conditions of the Experiment Station, I found that its resources had been so husbanded, under the careful management of Director Armsby, that there was the sum of \$7,000.00 coming from the Federal Government and known as the Adams Fund which must be expended before June 30, 1907. Of this sum, \$4,200.00 had been set aside for work in Animal Nutrition. The Executive Committee has, therefore, agreed to set aside the remaining \$2,800.00 to be spent upon some definite horticultural investigation before June 30, 1907, with the expectation of continuing these investigations out of the Adams Fund and other funds after that date.

Just what these investigations will be must be decided in consultation with the man who will be employed to execute these experiments. In this matter, the Dean and Director desires the counsel and advice of the State Horticultural Society. The Experiment Station desires to meet the most important needs of the horticultural industries first and leave the less pressing needs for later investigation. The Director, however, feels sure that the time has arrived when the investigations made at the Experiment Station in Centre county are not sufficient to meet the needs of the horticulturists in Erie and Lancaster counties. The Experiment Station of the future will be just as large as the State of Pennsylvania. Probably, therefore, the most important work in the beginning is to get acquainted with this State-wide Experiment Station by making a sort of reconnaissance, not for war but for peace; not for bullets and bayonets but for fruits and flowers; after which the most important problems can be studied in the most effective place and in the most effective manner.

COLD STORAGE—WHAT IT MEANS TO THE HORTICULTURIST.

By A. S. DeVOUT.

THE PRESIDENT.—We are all interested to know how to get the most dollars out of fruit, and we have invited Mr. A. S. DeVout, Manager of the Brelsford Packing & Storage Co., of this city, to talk to us a little while on Cold Storage and what it means to the horticulturist.

MR. DEVOUT.—Mr. Chairman, Ladies and Gentlemen: I feel somewhat out of place this evening. In the first place I am not a public speaker, and in the second place, after listening to the remarks of the gentleman who have preceded me, men who have had much practical experience, and closely in touch with the various branches of the business of a Horticulturist, I may properly say that I feel out of place. When your Chairman, Mr. Hiester, came to our office and asked Mr. Worden, the Secretary and Treasurer of our Company, to fill this place on your program, he was after the right man, for he has had charge of the storage branch of our business

since we have rented storage. However, I have agreed to take his place and tell you something about cold storage, although what I have to say may not enlighten you as much as it should in regard to the storage of fruits. I know as much about horticulture as the hog that Professor Warren told us about in connection with the orchard. I have always looked on the hog as being good for one thing, and that is hams, bacon and lard; but I am glad to hear that it has other merits. Now as to Cold Storage. As most of the great inventions of the past century have had to pass through an experimental stage or period of existence, so has this been true of the different refrigeration systems that have been invented and tried during the past thirty years. The original method was called the absorbtion system, but it was soon discovered that while it was a sensible method, yet the compression system was the more practical, and this has almost entirely superseded the absorbtion system, except where fuel and water are cheap. The compression system with brine as a circulating medium is the one in use at our plant. About four years ago we enlarged our plant, which is really a pork-packing institution. While we had for quite a number of years taken in some outside storage as a matter of accommodation, yet it was not until this time that we made it practical in this direction, and since then we have done some outside storing. We find that apples, pears, peaches as well as berries, vegetables, oranges, lemons and other fruits, can be kept with a positive degree of success in our storage rooms. Of course you might imagine that melons and such fruit which are of a juicy character will not carry so well, also that over-ripe fruit will not keep for any length of time, although cold storage has saved thousands of dollars on account of a temporary over-stocked market, and also on account of the weather. Right here I wish to say that this should be of great advantage to horticulturists because I have noticed that most of the apples stored in our place have been for the produce and fruit dealers in Harrisburg, and very little for the fruit raiser himself. In other words, the crops of the fruit raiser come in at a time when they bring the least money, and the commission and produce dealers buy these crops and put them in storage somewhere, and reap the benefit that is to be derived by holding them until there is a rise in the market. Now most of our storage, of course, has been in the line of butter and eggs, while that has no immediate relation to the business of the horticulturist, yet the fruit raiser is frequently a producer of butter and eggs, as well. But I see no reason why the fruit raiser should not take advantage of this opportunity to carry his fruit. It certainly is a practical method to pursue.

In our place of business, it is true, we have not carried as much fruit this last year, and the reason for this I do not know, except that we have not gone after the business. I am not here talking for business, we have a very limited space of cold storage to rent in connection with our other business, and we encourage the storing of eggs, because we put them in in the early part of the season, and they stay there all summer, which makes them the least expensive goods for us to carry, but we never turn down any man with fruit, if we have any room at all. We always have a little room for the horticulturist, so that while I am not here to solicit business, yet I feel that the fruit grower should take advantage of this opportunity

to get as much money out of his goods as other men do, if not at our plant, elsewhere. Here are men who are producing butter and eggs and have been storing for years. Why should not the fruit growers do the same thing. I want to say that you cannot make rotten fruit ripe in a cold storage house, but you can keep good solid fruit in good condition. We have some pears in our cold storage plant now, which were put in last fall in an over-ripe condition, and they are now in good condition, and Mr. Hiester has stored more or less fruit with us for a number of years, and I think a great deal of it in an experimental way, and I think he would be able to tell you more in a practical way of the results obtained than I am able to do.

The temperature carried is from 32 to 38 degrees. Solid fruit held long, should be carried at a low temperature, and those for a shorter period at a higher temperature, and should warm up slowly, and have a circulation of air to dry them off. I find this is quite important in the storage of fruits. I know that we have stored quite frequently a large quantity of lemons, which is a very perishable piece of property. I have seen lemons put in cold storage, lemons that were not over-ripe, kept possibly two months with very good results, and then again I have seen them put in there in poor condition, and packed in crates, with wet mucky papers around them, and come out in very bad condition. But lemons put into storage with nice clean wrappers around them will invariably come out all right, and it seems to me that if lemons will do this, that perishable fruits, such as pears, plums and apples, ought to keep just as well. I believe that it is positively necessary when these fruits come out of this temperature to have them warm up slowly in order that the moisture should dry off before they are put on the market. I might also say that I believe it is good policy in storing fruits that they be stored in ventilated packages, and I also believe it is an advantage to store fruits in small packages rather than in large ones. This, I am satisfied, has brought about the best results.

Professor Surface, who possibly may be present, put in our rooms quite a few samples of chestnuts last fall. I think they are over there yet. I believe his object was to find out the advantages of cold storage in relation to the chestnut worm. I have not heard what his results were, but one of his deputies gave me some of the samples, and he told me in regard to the keeping quality of the chestnuts, that the results were splendid. I found that the chestnuts which had been put in a freezing room and carried at a temperature of 22 degrees Fahrenheit, were full of frost, and in fact tasteless, and of course necessarily worthless, while the chestnuts carried at a temperature of 32 degrees, and I think in another room of 38 degrees, were not only in the best of condition, but I doubt if anyone could have told them from a fresh chestnut; their flavor was elegant. I am very anxious to see how he made out in regard to the worms. He might be able to freeze them, but I am afraid that at a higher temperature he did not do much damage to the worm.

There is one thing very essential in the cold storage of fruits, and that is that the temperature be carried evenly. This can only be brought about by artificial refrigeration, there is no question about that at all. I also believe that there is only one method of artificial

refrigeration that is practical and that is brine circulation as a medium. Many of you have seen the cold storage machinery in breweries and packing houses, what is called the expansion system. I do not believe this is practical for the cold storage of fruits. I think you have Mr. McKay from Philadelphia here, and he might disagree with me on some of these points. If he speaks to you tomorrow, take his word, because he knows more about it than I do. In relation to brine circulation with this system, if you have any trouble with your machinery for a short time, you can make repairs without fear of varying the temperature, because you have a large quantity of brine in the storage tank which can be circulated and the temperature regulated by turning off or on the coils of pipe in the room. Another advantage, too, is this: That the ammonia, which is the general medium used in refrigeration is entirely separate and away from the cold storage room; it is down in the engine room, and there is nothing going through your coils but cold brine which can do no harm in case of accidental breakage.

There is one thing about Harrisburg that I might say in relation to cold storage, and that is, as to its central location. There is no reason why Harrisburg should not make an excellent distributing point for the horticulturists in this section, or other sections, and fruit shipped from other states and to other states. We are not very far from New York, and we are in close touch with Baltimore and Philadelphia, and we have the best kind of railroad facilities. I do not know why Harrisburg should not be an ideal place for the storage of fruits and their distribution, nor do I know why horticulturists should not take advantage of these opportunities in addition to the advantages he has in cold storage.

As I said before, I am not here to talk business, we have very little cold storage room to offer, but we would be glad to rent to anyone what we have. To sum the matter up, Mr. Hiester wanted me to make a few remarks with reference to the advantage of cold storage. I simply say that those advantages are being used by others and that the farmers and fruit growers should have the primary use of it, and I believe that the time is coming when the horticulturist will see more advantages in the use of cold storage than at the present time. I thank you very much for your kind attention.

MONEY IN PEACH CULTURE.

By J. H. HALE.

THE PRESIDENT.—In presenting this gentleman, I would say that he does not need an introduction.

MR. HALE.—Mr. President, Ladies and Gentlemen: Please don't applaud like that. If you do that, I shall have to tell you a story. Some one has said that married men do not live longer than single men, only it seems longer. So the program as it was made up for

this evening, and my coming in at the tail end made the evening seem a little long to me. One of the disappointments or lack of pleasure of interest that came to me is this, when one is expected to say something, it takes the edge out of it somewhat, as the man whose good wife lay dying, and she was satisfied to go, and she took John by the hand and said, "I am sorry to go, but I am not going to place any restrictions upon you, except one little request; at my funeral just ride in the carriage with mother." John immediately replied, "Yes, Mary; yes, but it will destroy the pleasure of the day for me." So to appear here at this late hour has taken one of the pleasures of the day out of me.

The subject that has been assigned to me is a pretty broad one. Your Secretary asked me to speak on the subject of peach culture, tillage and marketing, but I won't go into all those features of it. There is so much that might be said and so far reaching in its effect, that a good deal will have to be left out for questions that may be asked hereafter. The growth of the peach in America, commercially, is a comparatively new enterprise; that is, when you take into consideration the extensive scale in which they are now grown. The old commercial peach growing was only in a few favored places in the United States, and that was in Delaware and New Jersey, and some in Michigan. At one time those places were supposed to be about the only "peach region" in America, and the season was a very short one. The marketing of peaches in New Jersey was about three or four weeks, and then they were gone; so in Michigan, they were used mostly for canning purposes, and were bought up practically for the purpose of canning, and for the purpose of a local supply, as well as in other sections of the country where they could be grown, but on the whole they were the particular sections from which they could be shipped to other places in a commercial way. Now, there is a "season" of six months or more of the peach market in America. This has come about through various reasons. One was that which Prof. Warren touched on, the increased appreciation of fruit as a food product. Fruit was once a sort of luxury, as the years have gone by. By looking up fruit growing statistics in New England, the records of the Massachusetts societies, and other societies, seem to show that the early planting by the Plymouth and Jamestown colonies in connection with the fruit were simply for the purpose of making something to drink out of their fruit. But now we know as a staple article of food, fruit has been steadily increasing in use and value, and I think the organizations which you have so largely introduced in Pennsylvania, New York and New England, known as the Grange, have had much to do with encouraging the fruit as food idea, the Goddess Pomona constantly reminding us that fruit is the one food that comes from the hand of God without any preparation or cooking, and that is something to stimulate us to a daily use of fruit. The demand for the peach as a healthy food has been one of the prime causes for its increased use six months of the year.

Another prime cause for its extensive use is the character of advertising and the displaying of fruits, as we all observe in our foreign friends, who put on the fruit stands the very best fruit obtainable, and they make it show better than anyone else; and now, we have not only the fruit dealer, but the grocery man, in the large

cities, who are on to the job and employ special fruit men to make a fine showing of their fruit. I know in New England at many groceries, they have fruit specialists at \$25 or \$30 a week who make a fine display and who put out a splendid display of fruit, in order to make it more attractive, and be better able to sell it to customers, because its attractive beauty has first caught the eye.

We have been complaining of this gobbling up of small railroad lines by richer ones, yet the consolidation of railroad lines in this great country of ours has had much to do with the increased fruit consumption, for by these consolidated through railroad lines, it has been made possible to ship peaches into regions where they could not have gone before. This is also owing to the development of the refrigerator car. While it was possible in earlier days to ship peaches from the Delaware Peninsula, they did not go further than the fruit would bear shipping on slow trains in ventilated cars, but now the market may be five hundred, one thousand, or two thousand miles away, and we go there and deliver the fruit in fine order, and this is owing to the invention of the refrigerator car and the consolidating of railroad lines.

Then, the new style of packages has also had its influence in increasing the supply and distribution of fruit, because we can now ship it in crates and smaller baskets, in all sizes, which make fancy looking and lighter packages, and I would say right here that the character of our packages has also had very much to do with the increased consumption of fruit. Then, also bringing about a newer type of peach; peaches that are more hardy in their bud, and are larger bearers and more resistant to the frost in the bud, are much better, has had a great deal to do with the increased production, and we find that they are much better to ship and keep than the old Persian types we had been growing; I am speaking of the North China type now. So to-day, with the exception of Northern New England, and the Northwestern states beyond the Lakes, we grow peaches in practically every state in the Union, and I might say in almost every county. That is a little bit strong, but I can say that there is not specially a particular region where they cannot be grown to a greater or less degree of success, and it is not necessary to go off your farm or certainly not out of your township to grow peaches of one or more varieties, if you desire to grow them. And these are the reasons that we have "the peach season" six months of the year, instead of three or four weeks, as heretofore.

Now, what are the essentials to successful peach growing? It strikes me, after a life's work in the cultivation of the peach, studying the conditions of my fellow man, together with the market conditions, and all other things, that would help to stimulate peach growing, I have come to the conclusion that the best foundation for success, lies in the man or woman who has taken up the job. I find men and women succeeding in many localities, and their neighbors failing by the wayside, although the conditions are the same with both. I find that everywhere; so it seems to me, the first thing is the man. Life is pretty short and pretty sweet to most of us, and I think most of us ought to be doing something we like all the time. I don't mean to be on a jag all the time. I don't believe we should get up every morning and go out to something, that is our life work, that is distasteful to us. I believe there is something for every man

and woman to do, what they love most to do, and I believe the man or woman who grows peaches should first love the peaches for their own sake. I think the man who shoes a horse, should love to shoe him, and have him go on his journey better fitted to do the work that is intended for him to do, and that he loves the horse better than the man who just wants to drive the nails in. We sometimes forget that there are some who are just as well fitted to raise potatoes as peaches, and if he can get more for the potatoes, he had rather raise them, but we sometimes forget what our love is, the man who likes to grow peaches better than he does potatoes, will make most money with peaches.

I was visiting a friend in New York State. In the morning we drove into the railroad station—it was the day after Thanksgiving—and while standing there, a slick looking, well dressed fellow purchased his ticket, and I noticed him put some change in his pocket, and walk away, and leave his ticket there, and my friend took it over to him and handed it to him, and said, "I guess you were down spending the night with your girl, or in love, you are so forgetful." "No, I am not in love, I am married." So I think some of us forget we are in love, but just married, and so keep on working for money rather than plums.

Almost any soil will grow a peach tree, but a light, sandy loam will not grow a too vigorous tree. If I take my choice, I would have a lighter soil for the peach tree than for any other tree fruit, providing the elevation was all right. In certain stiff clay soil the Crawford varieties will thrive, but a good loamy soil is good enough. I don't want to plant in valleys or in hollows, but I want to climb up the hill and plant my trees there. Some people talk about the eastern slope and the southern slope. I don't think it makes very much difference, if you have got enough elevation above the surrounding country so there will be good air, frost, and water drainage.

The market location is a very important point. We want to be near a market, if we want to sell at home. Of course, the market is all over America, but if we are growing them in a small way, our facilities for shipping are lessened, because shipping by express is demoralizing; so if you are not blessed with a home market, you want to engage in it large enough to be able to ship in car lots either alone or in combinations with neighbors, and you must fit yourself in your orchard, and keep yourself in touch with the local conditions that surround you.

The labor question is getting to be an important one and must be taken into consideration. The labor question in agriculture today, or in any line, is one that must be thought of very carefully. The variety we should plant is also another question, and the harvesting you must cover by considering the labor problem. It is one of the important factors of the day in ascertaining where you can get your labor at harvesting season. You might be able to harvest your fruit at a certain season of the year and have an abundance of help, while two or three weeks later or earlier, you could not obtain sufficient labor to harvest your crop. So that the selection of varieties has to be made not only in relation to markets, but to the labor question as well.

In Connecticut, where I grow them, and down in Georgia, while I

am able to get labor when I wanted it, yet two weeks earlier I could not get labor at all, for our crops come due just after the cotton culture season is over and is laid by, and they will come there just at the right time and help us out on the peach harvest before cotton picking begins, so it is in my Connecticut orchard, for the reason that I am near the large cities and can bring from New York and Boston a certain number of Italians, who love fruit, and like to be among fruit. They are working in New York in hotels, as waiters, and get from eight to ten dollars in salaries, and about as much in "tips," and right here I want to say that I am opposed to "tips." I will pay the landlord all he asks, but I won't pay the waiter one cent. I say we are able to get Italian waiters from the better class of hotels to come to us through the peach season, because they truly love fruit and want a picnic, and they come there and camp out, and have a good time. To them it is like going to the mountains, or to the shore, only they get paid \$9 a week for their fun.

On the labor question, a man wants to be informed with reference to it beforehand in the peach business, rather than afterwards, and understand what the conditions are in the locality in which he puts out his orchard. Those are some of the essentials.

Now, then, we have discussed the man, and the soil, and its elevation, and in relation to the market and the railroads, and the labor question. Another difficult question in a way, and a very serious one, is the climatic conditions, for the reason that in the northern section there is the killing of buds in a dormant condition in winter time. We can head that off to some extent by climbing the hills and planting proper varieties, and by proper cultivation. Now, south of this section there is the danger of early swelling of the buds, and early blooming, and the spring frosts after the buds open. In the north there is very little danger to the killing of the bloom and buds in blooming season. I should think that was the first and great difficulty in the way of profitable peach growing.

Another difficulty in the way of the growing of peach trees along the Blue Range and north, is the yellows, a thing we know very little about, except it is sure death when it gets in our orchards, and we have to guard against that by pulling our trees out at the first sign of this disease. Another difficulty is the monilia or brown rot, and another, the leaf curl with certain varieties, notably with the yellow ones, but since we follow spraying, it is thoroughly controlled. The borers are always with us, and may be kept out by banking the tree during the early season, while the moth is flying, and the black smut that infests our fruit, where the trees are too closely planted, and where we use too much nitrogenous matter. Lastly, the San José Scale, that scared the life out of us a few years ago, but it has been a benefit in some ways, because when a man is fighting that, he is fighting a great many other things, and is weeding them out.

You can't grow peaches without culture. You can't grow them successfully and profitably without thorough culture. Just as Prof. Warren said about the man who wants to cultivate his orchard in corn; he is a man who should go out of the peach business, and go to raising corn. Just like a man in Massachusetts who planted a few hundred trees and left them grow up in grass, as he said he

would make sure of a hay crop anyway. I said to him, "Your orchard has gone to grass sure." Cultivate your peach orchard just as early as possible the very first thing in the spring. Let it be April and May and well into June. If you don't seed to a cover crop then let it go to weeds, but don't let it go until June or even the middle of July. I repeat, cultivate early and cut it up thoroughly and often, but late in season. Let it grow up to grass and weeds, rather than cultivate too late.

The pruning question is an important one along with the necessity for spraying. We must have low headed trees. Some gentleman was telling here to-day—I thought he was stretching it a little bit—about his trees being higher than the ceiling of this hall, but he was talking about apple trees. We want low headed peach trees. In planting I cut the stems down to eight or ten inches, and build up my tree, and prune with the general object in view of having a broad low headed tree. Just how to do that, each one must study it out for himself. You can't tell how to trim a peach tree any more than you can tell about hugging a girl. Just do the proper thing at the right time, the peach will show you how by her blushes.

A Member.—How will you cultivate them if they are low down?

MR. HALE.—Take a mule or two, and then take two spring tooth harrows, divide them and put a wooden spreader between them and let one of them go up close to the trees and while you and the horses are going merrily down between the middle of the rows of trees, the harrows will be doing their work. Clear up under the low heads.

The question is often asked, why do you get such good fruit from two or three thousand miles away? Because they have to grow, pick and pack them properly in order to get them to market. We want these low headed trees, because we want to get to the tree and spray, prune, thin and pick the fruit more easily, because in such cases we can come up to the tree and do all the work without the use of long ladders that add 60 to 80 per cent. to the labor cost.

I repeat that we must spray the trees. The Lord and the San José Scale—I don't know whether they are in partnership, but the pest has brought about a benefit in more ways than one. When we are annoyed with them we must spray our trees, or our trees will die. The "Bugologists" have been telling us for the last twenty-five years that we should spray, but we did not believe them, and now the San José Scale says we must, and therefore we have gone to work in the spraying of our fruit trees, to get rid of this pest, and in doing so, we also aid the tree in various ways, for the lime and sulphur spray mixture, best for destroying scale, is also a superb fungicide, a preventive of monilia and leaf curl, smuts and sooty fungus.

Another point about which I wish to say a word, is the necessity of thinning the tree of surplus fruit, in order, by taking off all the imperfect specimens, and more, if necessary, that we can raise a big crop of more perfect fruit. The thinning of the fruit is essential, first, in order to get a larger peach, and secondly, in order to get a better colored peach, and thirdly, to get a better flavored peach. So a tree that would naturally bear, perhaps, a thousand peaches, should be thinned down to four hundred, the four hundred will bring

more pounds than the thousand, and will bring you, perhaps, double, or treble the amount in money, as it is the large, high colored, fine flavored peaches that pay best.

In my market I have graded my fruit into three grades, and we market it in one-half bushel or Jersey baskets. A one-half bushel basket of number ones has about one hundred to one hundred and ten peaches in them, and sell for say about one dollar, and a one-half bushel basket which would have sixty or seventy extra sized peaches in it would sell for one dollar and a half, so that is Bryan's sixteen to one taking it backwards, while the smaller sizes from unthinned trees, may run 175 to 225 per basket, and be slow sale at 50 cents per basket.

As to the manner of pruning of those trees. I get a good strong one year tree, and chop it off at the top, at time of planting and plant it out and cut it back to about eight or ten or twelve inches, according to my wish, or convenience, and when it starts to grow it will start out sprouts all along the tree from the base up, and those you should rub off, except three or four or possibly five nearest the top; let those three to five grow at will until the following season, and before the growth begins, do your pruning first by cutting out entirely one or perhaps two of these remaining stems that may be out of place, then cut off from one-half to two-thirds of the growth of those that remain, and then perhaps thin out some of the little side branches from there. They will start to grow again and each one of these will make a strong growth, and in the second year you will treat it much the same way as you did the first. The third year, instead of doing as you did the former years, if you want peaches, do a little summer pruning. Cut out the inside branches; don't cut anything outside, but from the centre. Cut out so you have an even distribution of the branches, and cut off the tops of the leading main branches. The third summer will usually throw those trees into developing a big lot of fruit buds that will bear a crop of peaches. You will likely get a good crop the fourth year.

By my pruning methods I have perhaps the worst looking orchards in America, but am lead to believe I have the greatest amount of money out of them of any one in the country, and I assure you I have a great deal of pleasure out of them also.

Now, after having suggested some of the general methods of producing a fine crop of fruit, I am not going into details of the culture and general methods of orchard handling, because I have not the time. I find that fruit well grown under the best methods of culture and care, needs careful picking when it is ripe, not when it is green or overripe, but when it comes full grown and colored, and that is the time you need to pick. You should pick over your trees from four to six times to get the fruit in its most perfect ripe condition. At the first picking you may not get more than a dozen specimens from a tree. The next time not so much more, and the third picking you will get much more, and then at your fourth picking they will begin to drop, but it takes from twelve to eighteen days to get all the fruit off any one tree. Then, further, you want to assort your peaches. I believe you have a sorting machine through this State, and they are the invention of the Devil. I don't mean these men, who invent and sell them are Devils but it is the spirit of the Devil

that would attempt to assort beautiful delicate peaches with a machine of any kind, and hope to preserve their beauty.

A Member.—Do your Italians know what kind of fruit to pick?

MR. HALE.—I wish I knew one-half as much about fruit as those Italians from the North of Italy. In that section of Italy they have been reared among fruit for a thousand years, and they know how to handle a peach just as a mother knows how to handle a baby; just at the right time and right place.

Another important factor in the handling of fruit is, that it wants to be packed carefully, and as tight as you can get it, and honestly packed from top to bottom, so that there is no difference in the character of the fruit all the way through. Each and every package if it is a Georgia carrier, the lower tier of basket should be so full that the tray will fit firmly down on the fruit, the upper tier of baskets should be so full that the cover when nailed on, will bring a full pressure down on the fruit. Where you use a climax basket with a cover, have the basket so full that there is a strong pressure on the fruit. In New England we use a special colored red netting entirely, simply to hold the fruit in its place, and keep those who handle it on its way to market from stealing it. But honest packing and honest assorting will pay more than anything else. I think that is the one great essential, and after you have done that, every basket of peaches should be labeled with the name of the shipper, and his post office address, and any other statement of fact and taffy you want to give your customers that will aid them to know and appreciate your fruit. After it is packed honestly you are entitled to toot your own horn all you want.

It pays to advertise horticultural and orchard products as well as other lines of business. Every farmer should be an advertiser of his products. There is no reason why he should not do so, any more than the man in other business. I think every farm should be named. I go through Harrisburg, or Philadelphia, or through any of your prosperous towns of Pennsylvania, and see manufacturing establishments in full blast, and see a great sign somewhere in connection with the operations of the plant telling me who owns it, and what they are manufacturing, and in that way we know where to get the manufactured articles. I reiterate, it is just as profitable business to put out a sign at the farm, and on our packages proclaiming to the world your business, and who you are. If you are doing a good business, it will bring others there, and if you are not, it will turn them away. It looks as if the farmers were ashamed of their business in not advertising in some way their products. Put up a little blackboard at the farm, and state on it who owns it, and what that farm sells then chalk up from day to day or week by week, just what you may have for sale at that particular time. If you have a good peach crop, and are to sell in home market, you should advertise in the local press that you are doing business, and what you have, and do it legitimately and well. If you sell to retail dealers, it is necessary to advertise, either by letter or a personal call so they can come to your orchard and see what you have, and also write them to come when your orchard is in full bloom, and they will see that it is clean, and will produce clean fruit. I say get them out, if you have to pay their railroad fare; bring them out when it is

bearing, and show them how you pack your fruit, and show them every detail of your business, because you want to get them in sympathy with you and your fruit, and then they will make their customers give you about twenty-five per cent. more for that fruit, because they are in touch with it and know it is the best of its kind. If you are dealing on a large scale, and wish to deal with a man who buys on a large scale, whether he is living in New York, Cleveland, Chicago or Baltimore, say to him, "Come down here and see the orchard, and see what I am doing; how I am doing it;" and if he don't come, some other man will; that is, some man who wants your account will come; if they come there and see your goods they will keep in touch with you, and you will get the confidence of those men, and you will come in sympathy with each other. And there is big profit in faith and confidence.

Some people don't pack their fruit quite as carefully as they ought and ship to some one whom they never saw, but their neighbors say he is a good man, and gets a moderate return, and another replies, that fellow cheated me, and the result is he does not get what they are worth, but if the commission man knows you and knows your goods are always all right you will get good dividends out of them. It is not right to build up a good orchard and lose our profits out of them, because we have not been able to get our fruit to the right men in the right market. The most profitable markets in Pennsylvania, and all other states, are the local markets; of course, they may not be a large factor for everyone, but the little orchards all over this country wholly supply in their season all the market peaches that heretofore were supplied by Delaware or New Jersey, but it matters not how many come to the different places they cannot compete with the home grown peaches delivered to the families fresh from the orchards each morning. They will always have first call there, and there is a saving in freight charges, and a saving of the commission. If you do a little business and come in contact with the consumer, the retailer's as well as the wholesalers profits is cut out, and everything is to the good. I know that time and time again people have produced fine fruit, and shipped it away, and paid the railroad charges and commission, and it might have been sold at their home market for more money than they received by shipping them away. Pennsylvania is an enormously rich State, and people in Pennsylvania are making money, and they want home grown fruit, and the home markets are worth more than any other. Don't forget the home market and the home supply.

Now, as to Pennsylvania's opportunities: A gentleman told us about those splendid apple orchards up in Western New York, and we have heard about the wonderful fruit producing orchards in the West, but I say now that no State in the Union has so much fruit growing territory as Pennsylvania. In Western New York they stick apple trees into that rich soil and they grow to great size, but your hilly lands of Pennsylvania are worth ten times as much as the western New York districts are. I want to say that those orchards up there are going off the face of the earth when Pennsylvania gets on to its job and plants them on the hills, just as they are doing along the Hudson, and as we are doing in New England, and the latter orchards will put the others out of business, if the scale has not already got such a hold of them as will finish the job.

I spoke about cultivating the far away markets and sometimes in neglecting the near ones at home. I have suffered from doing it, and I am drifting more to the home market as a safe and sure friend that it pays to stick to. In the rush of harvest in Georgia we bring in some six or eight hundred colored laborers, and put them in camps and huts there, and have a day watchman, and a night watchman. They sometimes get into trouble, and when in trouble, we bring them up before the local farm court—sometimes I am judge, and sometimes I am prosecuting attorney and my Superintendent the judge—and we settle them right there, so as to keep them out of the city and town courts, because if they get there, they will give the offender pretty hard treatment; or if he is a scalawag we always turn him over to the proper authorities and they usually put him in the chain gang, or on the roads. Evidently many of you don't expect to get into jail. How you expect to escape with the many temptations in Harrisburg, I don't know. One Saturday night our watchman discovered some colored gamblers who came over from Savannah, and we arrested three, and sent them into town, and the fourth one we arrested, and we did not know whether he was a genuine gambler, or not, but we tried him before our own farm court—I was judge on that occasion—and one old darky began to edge his way up to the front, and took off his cap as he saluted me, and he said "Seuse me, Cap'n, you is Jedge, an' a very just Jedge," (giving me a little taffy; he is the real thing when it comes to taffy); he says "Jedge, you ain't goin' thar right way to get the truth out of these men; I'm a little older than you; 'seuse me for interference", and I said "No interference at all"; he said "I have experienced you askin' these niggers who is in the game and who gets the money; my experience in life is this: The nigger that wins never knows nothin'; you have got to get the truth out of the nigger that loses." How like us poor white trash when we are on easy street we don't squeal, but just as soon as we begin to lose in the game, we tell the truth. So I want to tell you out of experience of being pinched in distant markets that your local markets are the best, if you want to get the best net money out of your fruit.

Pennsylvania has greater opportunities than any of the Eastern states that I know of. I never ride through your State and look out at the rolling hills, but what I feel that I would like to get a few hundred thousand acres of those hills into orchards. Don't fear the Southwest. Two years ago it cost me sixty-four thousand dollars for railroad transportation alone to get my Georgia peaches into the market. Now the lands I have had my eyes on, from what I can see in traveling on the railroads, are your beautiful rolling hills in grass. You also have a lot of chestnut ridges, and they are the next to take up with a view to making them useful in this direction. In the last three or four years I have taken up three or four hundred acres of land where there were chestnut sprouts grown up and it was covered with rocks and stumps. When it came to assessing the lands the men who owned them held up their right hands and swore they were not worth more than three dollars an acre, and when I wanted to buy them, they wanted twenty dollars an acre. I have bought such lands prices varying from ten to thirty dollars an acre, and cut down the trees, small brush and undergrowth and planted them in peaches. At another location I picked on a hill

that I wanted for apple trees, and I had this growth cut off in mid-summer, and in the fall set fire to it, burning nearly clean without any piling, and surveyed off the rows thirty-six feet apart each way, and whether the place for a tree went on a stump or rock, we dug the holes, and about sixty per cent. of those holes were dug with dynamite to blow out the stumps and rocks so as to get the tree right where I wanted it. When this planting was going on, an Italian who had been with me eight or ten years, said, "Why not plant peach trees," and I said, "Peaches must be tilled; peaches want tillage better than apples and this land is too rough to till," and he replied, "This best peach land, no better land around than this for the peach, give you a finer tree; you want to plant this land with peach." I said to him, "It can't be done; it is too rough; it can't be tilled." In a day or two he came back again and tried to hammer it into me; he said, "I think more about peach; I tell you I work for you nine years; now I like to go in business for myself; you think no peach grow there; you make me a partner there, and I make the peach grow like hell." Now, Lewis's "hell" is really like heaven; he is one of those fellows who makes things grow, and my Secretary, when he went out said to me, "Mr. Hale, what are you going to do about that; whatever you are going to do, you had better be doing it, Lewis knows what good peach land is," and I made a contract with Louie to quit working on a salary, and move up there on the hill. Of course it took more dynamite, and he planted peach trees eighteen by eighteen between the apples which were thirty-six by thirty-six feet. Lewis's idea was to break up the ground pretty thoroughly and grub around those trees. Those trees were planted in better dug holes than most holes are dug in America for that purpose. He shook out all the grass roots, stones and trash of every kind, and made it fine and mellow as for fine seeds, and set the trees. We used there a moderate amount of fertilizer, and made a good start in the Spring, and he grubbed around the tree, so that there was a place about six feet in diameter thoroughly worked up around those trees and he hoed them over several times and they made a good growth that first Summer. I had across the way another orchard that I started the year before where the land had been cleared, most all stumps and stones got out at an expense of over one hundred dollars an acre, and well plowed, and as I went away I told Lewis, here is culture on the one side, and here is your grub method on the other. I went away in June, and came back in a couple of months, and found Lewis had a couple of Italian friends who had come from Italy, and he made a contract with those fellows to grub it over, the entire ground between the trees in one section of his orchard, and where he dug all over, they were growing there better than in the plowed land that it had cost \$100 per acre to clean, and he said "Mr. Hale, you want to grub hoe the whole business;" I said, "You said you were going to grub around the trees," and he said, "I did not tell you how much I was going to grub," and I concluded it would cost about three thousand dollars to grub that whole orchard, but they grew so much better, possibly it might pay to do it. The rocks and stones are as thick almost as your heads are here in this hall. Now the conditions would be almost as easy to plow in that land as it would be plow between your heads which I see before me. There were rocks weighing from two hundred to four hun-

dred pounds each and hardly room to pass between them but the trees grew so much better after the all over grub tillage that we decided that that land must be tilled, so we went in there with eight or ten horses and twelve men, and began to get out those stumps and rocks, and we were able to break it up at a cost of not only this great labor, but at the expense of smashing many plows. I called Louis attention to the fact that I paid two hundred dollars on his broken plows, and he said, "So much the better; the man that make plows, and don't sell them, don't buy any peaches." Even where we had not yet been able to plow the trees are growing beautifully. It is grubbed better than you or I could do it, as the Italian men will grub land away down deep, and give it a thorough grubbing and shaking up, and in a circle of eight feet in diameter. These trees however don't begin to grow as fast as we broke the plows, and the plow man is now buying peaches. I am getting a splendid orchard, and it will soon repay me all the money, and the people who eat that fruit will pay the bills. I am just paying out the money now, and expect a return from fruit buyers hereafter.

(Confusion in rear of the Hall).

So there is a rat going across the floor back there. I think if I have talked so that the rats are coming after me it is time to quit. I have told you about this rough orchard matter so as to inform you of what is going on in other sections of the country. I have another large orchard yet, and in which I am going to do the same thing. The time is passing away and I should quit, and I have not said but very few things that I meant to say about the general subject of peach culture, for the use of eighty millions of people, we find the production of the past not sufficient, and they want more; they want them delivered in greater quantity, in better style and over a larger season. The old style and size packages won't go any more, but the American market is hungry for good peaches, and the American pocket book is full of money for good peaches, and if you don't grow them, somebody else will.

THE PRESIDENT.—It was suggested that a committee be appointed to see the Governor and ask his pleasure about coming to our meeting, and on motion of Prof. Surface, the Chair was authorized to name such committee. I will appoint a committee and notify the gentlemen to-morrow morning. If there is no further business, we will taken a recess until to-morrow morning at 9 o'clock.

Adjourned.

MORNING SESSION, JANUARY 17, 1907.

THE PRESIDENT.—Owing to the fact that one of our speakers has an engagement at 10 o'clock we are obliged to transpose our program.

I will call upon Hon. William T. Creasy, of Catawissa, first, on the subject of "Apple Growing."

MR. CREASY.—Perhaps I owe the convention an apology for not giving more attention to the subject, in writing it up. The reason is that my time has been given up to matters pertaining to legislation and to other associations in which I am interested and take part.

In the Garden of Eden and down to the present time, the apple has been an important factor in civilization. No medicine has been equal to give health to those who eat thereof; no cosmetic can color the cheek of the maiden or artist paint such rosy tints as are produced to those who partake of this fruit.

The apple is king of fruits. It furnishes from one summer's end to another the most delicious and healthful foods and being the fruit of wisdom is used and appreciated by the nations of the highest civilization. When in bloom its fragrance and variegated tints present to the lover of nature a grand conception of the handiwork of the Almighty.

From the planting of the scion to the maturing of the tree, the culture affords the orchardist an enjoyable vocation. It initiates him into the mysteries of nature and teaches him reverence and adoration for a higher power.

Fruit growing, speaking in general, is humanizing, tending as it does to elevate the emotions and develop the finer sensibilities in mankind. But, you may ask, does this philosophizing pay us? Our more modern ideas have dropped the esthetical side of the proposition and adopted that of the practical. In other words his aim is the shekel rather than the beautiful and his inquiry is, does it pay? So I suppose you want me to discuss the commercial rather than the esthetical sides of the subject of apple growing.

The subject of location is probably one of the first things to consider, together with the value of the land. The orchard should be located close to the farm buildings so as to permit of pasturage. The apple adapts itself to many kinds of soil but where there is a hard pan it is useless to plant trees for as a rule they prove to be slow growers in such soil, after a certain age and also poor bearers. No amount of fertilizing will make up for a soil underlaid by an impervious hard pan. A northern exposure is preferable but an eastern will do. A southern exposure is not desirable.

Another reason why the orchard should be near the farm buildings is that it will be more convenient to store the crop which is getting to be a very important matter to consider.

As stated before the apple is not so particular as to the soil in which it is planted but a very warm soil is not at all desirable for winter apples, as it makes them mature too early. Early maturity is also sometimes brought on by too heavy fertilization with manures rich in nitrogen. Apples cannot be grown in soil that is not well drained.

The orchard should be cultivated until it arrives at the bearing age, which will vary some according to varieties. But I would say that it should be cultivated for the first ten years after planting. If this is not possible, however, good results can be obtained by mulching your trees with coarse manure or other available material.

Weeds and grass must be kept down by mowing for thus disposed of they make an excellent mulch. The cropping of an orchard is a practice not to be recommended, at any time unless it is the first few years after planting. After the orchard begins to bear nothing will be of better service than to allow the hogs to have free range in it. They will destroy all wormy apples and if fed well will manure the orchard. With this plan in force little attention is required except to see that the weeds and grass are kept down.

I am satisfied by actual experience that when orchards are pastured it is not necessary to spray for the codling moth. The orchardist will find it to his interest to keep a sharp watch on the outside trees, however, as they are the ones to be most troubled by this moth. By picking off the wormy apples on those trees in time, which may be done at odd hours, a crop of apples can be grown almost entirely free of wormy ones. As a protection from mice, rabbits, etc., we place a piece of sheet iron or other suitable material around the trunk of the tree to any height that may be desirable, say ten inches or one foot.

Raw bone, potash and stable manure are the best fertilizers for the apple, but they should be applied during the growing season. Labor and fertilizing must be reduced to a minimum because both are costly and that is why I am a strong advocate of pasturing orchards. I have a Baldwin orchard treated by this plan that produces as fine apples as are grown anywhere.

The orchardist is liable to make two fatal mistakes in planting trees. One is planting too many varieties and the other planting more trees than he can look after. Because after all success depends on quality more than quantity.

The fruit requires attention in every detail. If you sell direct to the consumer he expects a uniform quality and likely the same variety year after year. If I were to plant an orchard of 500 trees I would put in 499 Baldwins and one Northern Spy which I would top graft with a Baldwin.

In the selection of varieties one should be guided by the locality and the markets in which he sells. I find that the Fallawater which sells readily in our home markets is not at all saleable in other markets. Then again some varieties of apples produce more perfect specimens than others. That is to say you can pick more marketable apples of some varieties than others. This is one of the good traits of the Baldwin as compared with many other varieties. Color is also an important factor. The apple should not be picked until well colored, but it dare not get too ripe. The application of potash to orchards helps the coloring. Apples can also be colored after picking if put in slats, crates, or on small piles and exposed to the wind and some sunshine for a few days.

The subjects of pruning, harvesting, storing and selling are important, but I will leave them for others to discuss. In closing, I wish to say that the future looks brighter for the apple grower who will give attention to his business for with the formidable army of insects attacking the orchards, the worst of which is the San José Scale, the careless grower will be put out of business together with his inferior fruit.

THE PRESIDENT.—This subject has been divided up into several heads. We had hoped to go over the whole subject and then have a discussion. As Mr. Creasy, is obliged to leave in a few minutes opportunity is now given, if anyone desires it, to ask any questions at this time. Are there any remarks?

MR. LESHIER.—I would like to ask a few questions. Mr. Creasy has stated that he had a Baldwin orchard and cultivated it for a number of years. I would like to ask him if there is any difference

in the color of the Baldwin apple when cultivated and when not cultivated. That is, do they mature earlier when cultivated or mature earlier when not cultivated. The second question that I would like to ask him is, what proportion of the Baldwin apples are used for cider apples.

MR. CREASY.—In reply to the last question I would say that the Baldwin apple gives us few cider apples. They run pretty much the same size and we have very few that are wormy. We have only cultivated our Baldwin orchard a few years. We alternated it with peaches and farmed it the first year with potatoes and after that put nothing in it, but we cultivated the orchard while the peaches were growing and had some enormous crops for a few years, but I don't think I would do that again; I think I simply would plant it with apples. If you cannot cultivate the land on account of rocks and stumps I would phosphate it. The apples on our Baldwin orchards, that we have not farmed for a number of years, seem to ripen very nicely; in my estimation they ripen a little earlier than those that are cultivated, as a rule. While the specimens are very fine on the cultivated trees, and far above the average size, yet they drop a great deal more.

MR. LESHER.—You commence to pick about what season of the year?

MR. CREASY.—Whenever they begin to color. We have commenced the latter part of September in some years and some years in October. October is our month but it depends altogether on the color because it is important that they be colored.

DR. GUMP.—I don't wish to take exceptions to anything that the gentleman has said, but the honorable gentleman makes a mistake when he says if he planted an orchard of 499 trees he would plant them all Baldwin and the one Northern Spy and graft that to a Baldwin. That is too general. Twenty-five years experience in Southern Pennsylvania has taught me that the Baldwin apple is not a success with us. It is too far south. That is one reason why I think the gentleman makes a mistake when he advises the planting of Baldwin's entirely. That same advice was given me when I planted my orchard 25 years ago, by a gentleman who said if I planted an orchard of 500 trees, I should plant 499 Baldwin trees, and I said, what other variety would you plant? He said, I would make it a Baldwin. I did so, and, gentlemen, had I planted my 500 York Imperials instead of Baldwins, I would be worth \$10,000 more to-day. My Baldwin trees are large thrifty but they haven't given me 500 bushels a year to put in cold storage. They have given me apples but they fall too soon. If you pick them, as the honorable gentleman says, before they are ripe, I fear they would not be saleable, if you pick them when they are ripe they don't keep well. If you put them in a cold storage house cooled with ice, in our section, at a temperature of 32 to 34, they will speck for you; there appear little black specks on them. So I want to speak of this to show that the suggestion made by the gentleman is too far reaching for all of us. It is all right for Northern Pennsylvania and New York and even there, the Baldwin apple does not compare with ours so far as the quality and color are concerned. My Baldwin trees are a great deal larger than others, but I have a row of York Imperials 36 feet

from the Baldwins and they bring a great deal better results. This is practical experience.

A Member.—Do you take care of the orchard yourself?

DR. GUMP.—I look after it and help to see that it is done right. As to the cultivation I think he is perfectly right, and there is no doubt that to cultivate every year makes them too tender and they fall too soon. That is the best evidence that it is not best to cultivate them too often after they are 14 or 15 years old.

MR. CREASY.—After you live in a locality and determine what are the best varieties to plant, by observing the various varieties in that locality, your experience will teach you your market and what variety will best succeed. On my farm I plant Baldwins because I think it is the best variety for that locality. I do not wish to convey the impression that if I lived somewhere else I would plant Baldwins for I might not do it. With the kind of soil I have on my farm, I am confident that I will succeed best in growing Baldwin apples, and therefore I plant Baldwins. However, I don't say that, that would be the best variety to plant in some locality. Perhaps if I were living in some other locality I might plant York Imperials. You must find out by experience what is the best variety for your locality and your market. I am glad the Doctor spoke about this.

MR. ATKINSON.—I would like to help the gentleman from Southern Pennsylvania because I was induced to plant a great many Baldwins too and found they would not answer for me. I am in Montgomery county, which is about the same latitude as Harrisburg, and I found the Baldwins would not do for winter apples. I expected to grow them and keep them through the winter and found I could not do that. So I picked my Baldwins in September and put them on the market immediately, and I think, if the gentleman down in Pennsylvania will pick his Baldwins the latter part of August and put them in nice shape in barrels, and send them to the Philadelphia market he will get a good price for them, and perhaps, will get as much out of them as he does out of his York Imperials, and he will get more out of them by shipping them to the Philadelphia market than Mr. Creasy will get out of his while he is walking around watching his Baldwins grow red, because I don't think he will get any more for them, at the time he speaks of picking them, than he would earlier in the fall.

THE PRESIDENT.—Mr. Creasy is about to leave the room and we will take up another phase of this subject.

VARIETIES.

By PROF. GEO. C. BUTZ

I don't know of any other subject that is more difficult to talk on than this subject of varieties of fruits and yet, I am appealed to almost every day by persons writing to State College to know what variety they ought to plant, and sometimes they will

even ask what varieties they ought to plant out in other states. I don't know why they think we should know such things because it is one of the difficult things we have to deal with. As has been stated here it is largely a question of locality, of market, of soil and as to what the man wants to grow for, and very frequently the question comes before us as one of those difficult questions and is one of the least interesting problems that comes before us at an experiment station. Having gone over the State of Pennsylvania, I have been impressed with the fact that one particular variety is just the thing to grow and if we should know where they are best grown it would be worth a whole lot to us. I find in the bulletins some information on the varieties suitable for certain counties, but I think you will agree with me it is not an exhaustive study, and it is almost impossible to say what variety is best to be grown in any particular section. However, we find in the northern part of the State that the Baldwin and Northern Spy, perhaps the Baldwin more than the Spy, are counted on as being the best varieties for that section. Out in the western part of the State the Rome Beauty seems to be one of the best varieties. Down in the southern part of the State the York Imperial stands head and shoulder over all, and in the eastern part of the State they are in doubt as to what is best to tie to. So that in one county it is this variety and in another county it is that variety. Therefore, I say, it is not a very satisfactory thing to attempt to tell another man what varieties he ought to plant. We have also a number of varieties that are succeeding in other places, which are trying to find their way into Pennsylvania and some of these ought to be planted in an experimental way in the different sections of the State in order to determine their value.

Since hearing Dr. Funk speak of the Staman Winesap apple, and tasting some of the excellent fruit he had here yesterday I am very much impressed with that fruit, and think it ought to be planted in the south-eastern and southern part of this State. I usually tell persons who inquire with reference to the variety to plant, that it is necessary for them to examine the soil and select the varieties which is more or less known in the market where they handle their fruit, and to select an apple of medium size because it is more profitable than a large apple. Also to select an apple that is red in color and one that resists fungus diseases. I don't know any variety that is better with respect to this, than the York Imperial and I believe it will succeed in more counties than any other variety.

When I am asked in regard to the best variety as to quality I usually say the Baldwin, but in that the Baldwin is now suffering from that spot and they are less interested in the Baldwin because of that increasing condition of the Baldwin variety.

It would pay us in starting new to have our trees budded or top grafted by taking the scions from a resistant tree. So I say we seem to know in a little way what varieties are best to be planted. Our knowledge of that is something like the man that Joseph Jefferson tells us about who seemed to know something on every subject, and inviting some friends to his place, and after supper they sat on his porch and talking about different subjects Joseph Jefferson said to Mr. Jones, you are well informed, now tell us why one apple tree across the fence there, has no fruit on it, and the other is loaded with them, and Mr. Jones went over and dug down and took a piece of bark off the roots and showed where it had some substance on it

and said, that is the fungo mortem and when that occurs on the roots of a tree it cannot bear fruit but he did not take into account that the man was here yesterday and took the apples off that tree. I believe with Mr. Creasy who finds that the Baldwin is the best to be grown in his locality that, that is the apple which should be grown there and that in New York State where they find the Rome Beauty is a fine bearer and is of fine quality, that, that is the apple that should be planted there.

(The discussion following the presentation of the foregoing subject is omitted for want of space.)

SPRAYING AND THINNING.

By H. C. SNAVELY, Lebanon, Pa.

THE PRESIDENT.—Mr Snavely is not here. He has sent his paper which will be read by Mr. Lefevre.

After chosing a soil adapted for the best development of tree and fruit, relating varieties adapted to the particular locality and bestowing the best cultural attention, in the way of feeding and tillage; there yet remains the most important phase of successful fruit growing in general and apple growing in particular.

With the advent and increase of insect, pests and fungous diseases it has become impossible to maintain a vigorous and healthy tree, or to secure sound and attractive fruit, without a well considered and well directed plan of combatting insects and fungi.

The spraying outfit is indispensable with the up-to-date fruit grower. Before the appearance of the scale insects, it was possible to have live trees, though stripped of the foilage by the caterpillar or canker worm, and the fruit tunneled and furrowed by the coddling worm or gnarled and knotty by the work of the curculio or scabbed and rusty, ready to take an untimely leave and return to mother earth, saving the trouble and expense of thinning or picking, altogether an object lesson of ignorance, negligence and thriftlessness.

Since the scale insects cause the destruction of the trees, whoever wants to have live trees must resort to spraying, and whoever wants healthy trees and good fruit must also spray.

Spraying spells fighting, but the work must be well directed. This necessary part of orchard work is too disagreeable and too expensive to go about aimlessly.

One should know when to spray, how to spray and with what to spray for best results.

Sufficient literature is at the command of every one. The experiment stations all over the country have issued bulletins dealing with every phase of combatting fungi and insects that infest fruit trees. Our own State has furnished instruction not only through

bulletins but has sent demonstrators all over the State to show the people how to do the work. Whoever loses trees or has poor fruit for want of combatting orchard pests at this late day deserves no better.

While we have not wholly passed the experimental stage of spraying, enough is known, and at the command of every one, to enable the wide-awake to save his trees and to have good fruit.

Spraying has resolved itself into a business proposition. Does it pay?

Spraying is the price we must pay for fruit. Can you buy cheaper than raise it? That depends upon the man with the nozzle. Like in other activities some succeed and others fail.

I sometimes think the scale insects have come to us like a blessing in disguise. It has put lazy men and trees producing worthless fruit out of business, clearing the way for the intelligent and thrifty. It is the old story if the survival of the fittest.

There are those who wait for parasites to clean out the scale. To my mind unless the spraying is set in motion, the scale will do the clearing long before the parasites are due. The parasites will come, but the wise man will not sit down and whine, but he will hustle and fight and hold the field until the parasite reserves arrive.

What did we do with the potato beetle, we fought and fought for years, we raised potatoes, finer and better year after year, our warfare on the beetle was a success, and what do we behold, the parasite has come to relieve the sprayer.

But the sprayer is needed in the potato field as much as ever to combat the blights. So in the horticultural field, if the scale should disappear in a year the sprayer would continue to be a necessary adjunct.

Coming to the thinning of fruit there are several things and conditions precedent. On tall trees the work can not be done expeditiously or profitably. Trees should be trained to form low heads. Open, low headed and wide spreading trees are the only kind the progressive fruit grower can have. In planting keep this in view from the start, and if you have skyscrapers reduce the height to within a reasonable reach. By so doing one will be in a better condition to spray thoroughly, to thin the fruit and to gather it.

Some varieties seem to be persistent biennial bearers. This is largely due to overbearing in the fruit year. All the vitality of the tree is required to carry out the fruit and the trees fail to make buds for the succeeding year. Hence the so-called "off year." It seems that this condition can be changed by restricting the tree to moderate fruiting. I know this is a mooted proposition, but unless we have positive proof the contrary it seems worthy of trial. I also know that other conditions such as feeding and tillage will enter into this question. As in the matter spraying so in the matter of thinning fruit, it resolves itself into a business proposition. Will it pay? This depends on different things, but the principal one depends on the owner of the trees.

Choice fruit costs a good deal to produce, and for this, one must have a market calling for something extra, or the grower will be a loser. Choice fruit, if placed in attractive packages is always in

demand. There is always room at the top, it is the bottom that is crowded.

Within the limits of this paper I could not refer to formulas or to work in detail. My purpose was to point out the necessity and importance of combatting fungi and insect by means of spraying, and the feasibility of growing moderate quantities of first class fruit by thinning, that will command the highest price and prove remunerative to the grower.

GATHERING AND MARKETING.

By D. M. WERTZ, Quincy, Pa.

The fact of the matter is I think I would rather work than talk. You may not believe this, because possibly it still is not true. I urged the Secretary that it was a waste of paper to put my name on the program and ask me to talk about something that I knew so little about. So it is not my fault that I am making a few remarks to you to-day. The subject has been gone into so very thoroughly that I don't think of anything very serious or anything that would be additional to what has been already said.

There are several things, however, with reference to the gathering and marketing of fruit, one of which is that we should gather the apples when they have reached the highest degree of color, size and keeping quality.

Considerable has been said in regard to the Baldwin in the southern section of the State from which I come. That variety was not a success until we realized that we left them hang too long on the tree and by gathering them a little earlier we were able to save the crop and at the same time they did not suffer from loss of quality by so doing. The same would apply to the winter varieties. I never marketed but several commercial crops of apples in my life, consisting of York Imperial, Grimes' Golden and Ben Davis. Last year the York Imperial was very heavily set and the fruit dropped exceedingly. When they did this I saw that not only the efforts of that year but of all the previous years were dropping out of my hands, and I felt very much discouraged. In the face of this discouragement I concluded to gather them on piles in the orchard. In a short time a buyer came into the orchard and told me that I had gathered my York Imperial apples too early, that I should have left them hang longer, and yet if I had done so I likely would have lost the entire crop.

With my other varieties I find the same difficulty arises. It is very important to reduce the waste and loss to a minimum. In regard to that loss and waste, especially those apples that fall for us, more particularly in the commercial orchards, I believe apple growing like many other things is turning towards commercial lines. I think it is decidedly so with fruit growing, that the orchards will

become larger and there will be less of them and unless we are equipped to take care of the by-products the percentage of profit will be less, while they should be greater to the commercial grower just as in the petroleum or meat packing industry. While there is practically no profit in the main line of goods, there is in the by-products. So the question arises with reference to our fallen fruit and how best to handle it, whether it should be used by an evaporator, cider press or manufactured into a jelly product. It seems to me it is a subject that we should consider seriously and act upon intelligently.

I feel from my limited experience that I ought not to advise one way or another with reference to picking apples and putting them on piles under trees, which I did last year because I was not able to barrel them immediately. We picked the York Imperial in that way and they improved very much in color in the piles, but at the same time many of them sun scalded and there was considerable rot and decay, and on account of additional handling which resulted in additional expense I feel that under all the circumstances it was a mistake. I should have barreled them at once when picking. There may be points in favor of and against the principle but it seems to me it is best to have a barrelling table in the orchard and as the apples are picked in the bag or basket they should be emptied on the table and at once sorted and barreled for market.

Another important question is with reference to the handling of apples. I find a great many of us do not handle them as carefully as we should; we handle them as if they were stones or potatoes, while we should be more careful. We all know we can work with a poisonous liquid, and if we have no sores on our hands we will not be affected but if we do have a sore, there is great danger of blood poisoning. I look at the apple in the same way; that the skin should not be broken so that the germs cannot enter and make trouble later on.

Then after we have arranged about the barrelling, I feel that another important question is getting them into cold storage as quickly as possible. It seems, by the way of comparison, that we should pick fruit very much as we handle fresh meat, and we know of the desirability of cooling fresh meat as soon after the animal is killed as possible, and the same way with our fruit, the sooner it can be gotten into cold storage the better it will be.

Now with reference to marketing apples, it depends very much on the size of the crop and the kind of market the fruit grower has, or expects to supply. If he has a small crop it seems to me better to supply the local demands because it will require an orchard of considerable size until it would pay to erect a cold storage plant for his personal use.

MR. HALE.—What about the neighbors co-operating in the erection of a cold storage plant?

MR. WERTZ.—That might be the thing to do under certain conditions. The principle of co-operation is the coming principle, whether it be in railroads or any business line, and if the details could be worked out on a co-operative plan, and a plant erected, it might work out all right and be of great benefit. However, for farmers, on general principles, to erect a cold storage plant of their own, I think

they should consider it very carefully, or decide what market they are going to ship to and put them in the commercial cold storage houses in that city.

Cold storage is getting to be a scientific question of the day; it is a matter of not only the low temperature but even temperature and dry temperature, that possibly, we, as individuals, back on the orchards or on the farm might not be able to control.

I don't know of anything more I can say on this subject this morning. I thank for your courtesy.

THE PRESIDENT.—Mr. Hale, we would be very glad to have you open this discussion.

MR. HALE.—I think it is pretty well open already. I don't think there is anything more to be said only I would like to emphasize what I said before; that was, and it is a point Mr. Wertz did not touch on, this picking of apples when they are ready to pick and not all at one time. If we should grow tomatoes for the market or the family supply, when they begin to color we all know we go and pick the first ripe tomatoe, and we don't let them go on there until they are all ripe and decay in order to pick them at one time. No, we go there day by day and gather them as they mature. We also go day by day and pick our cantelopes and gather them as they mature, and sometimes we do that at different times in the same day, with both melons and cantelopes, because some are ripe in the afternoon that are not ripe in the forenoon. But the apples, the best of our fruits, we mostly let the first that mature go, and gather them when the last matures. We must gather our apples when they mature, even if it means one, two, three, four or five pickings. We must do it and the people who buy them must pay for the job. I know that this will strike some of you with wonder and amazement.

We must have the tree down low so as to reduce the cost of the thinning. These are not new ideas but business ideas, and as Mr. Wertz said, it looks to me as though the orchard proposition of America, that is, supplying these eighty millions of people with fruit, will drift into the hands of fewer people because those fewer people will see the necessity of taking up these subjects and treating them properly because it will pay, while the smaller planter will say, if it means two or three sprayings a year and means the thinning of the fruit and two or three pickings, I am down and out. As a matter of fact you have to put those additional things on it or you will go bankrupt in the way of growing your apples. If you grow apples for your family supply do it the old way, but the markets will say, stay at home with your fruit. I have seen on the Boston market over two dollars a bushel paid for apples that were grown by our competitors three thousand miles away, and they paid enormous rates, but they could afford to pay the freight on the apples. They followed the pruning methods; they followed the thinning methods, and the spraying methods, not once or twice, but a dozen of times. I have known apples over there that have been sprayed three or four times. Each individual apple had to be perfect and they wipe off every one, but that takes time, work and expense. Who pays for it? Those men who buy them in Harrisburg and other places. Those are the kind of apples that pay. I

saw over in your freight station yesterday apples all covered with smut and they are not the kind that will pay but will give a fellow the fits.

THE PRESIDENT.—We have two topics that must be held over until this afternoon. The first business after dinner will be the report of the Nominating Committee. Before we adjourn I wish to remind the audience that any person who wishes to join is welcome. We will be glad to have you. The Treasurer is going away this afternoon and he will be glad to see you at this time, if you desire to become members.

On motion, the hour of adjournment was fixed at 12:30 instead of 12 o'clock.

Prof. Surface, of committee to wait upon Governor Stuart and invite him to our meeting, reported having had an interview with the Governor, but that he was exceedingly busy at this time and was unable to come to the Hall. He stated, however, that he would be glad to meet the members personally after adjournment or at such time as may be mutually agreed upon. It was decided that the matter be further considered during the afternoon session.

The following paper was read by the Secretary:

CHESTNUT CULTURE IN PENNSYLVANIA.

By C. K. SOBER, Lewisburg, Pa.

The importance of the nut-growing industry in the United States is attracting more and more attention each year and the chestnut is gradually finding its place among the valuable nuts. In 1896 I began the experiment with cultivated chestnuts. With me chestnut cultivation is no longer a theory. On the hillsides of the beautiful Irish valley, near Shamokin, I have more than three hundred acres of young Paragon chestnut trees, nearly one hundred thousand of which have already been grafted. The Paragon has proven to be the best nut for cultivation. The nuts sell readily at from \$5.00 to \$8.00 per bushel, although it is thought that the prices will decrease as the supply becomes larger. It is claimed that even at \$2.50 per bushel, the crop will pay better than wheat. An acre of land will grow twenty-five bushels of wheat in a year if properly cultivated. A like area of chestnut trees will produce many times as many bushels of equally nutritious food yearly, for an indefinite period, and require no outlay for cultivation, planting or fertilization. More than this, the chestnut is generally not much affected by spring frosts, beating rains, and summer droughts, which are a constant menace to a wheat crop. Why then do we allow Southern Europe to exact a large tribute from us annually for the nuts we import?

Two methods of chestnut culture are offered. The Chestnut Grove and the Chestnut Orchard. The grove is possibly only where there

is a forest of native chestnut trees. The native trees are cut down during the winter and the young sprouts which arise during the next year are, when one or two years old, grafted with scions from cultivated nuts. The grafts made a rapid growth because of the established root system of the sprouts upon which they are grafted. When seedling chestnuts are grafted in the nursery, and afterward set out in rows, usually in cultivated land, the resulting growth is called an orchard. Sometimes the chestnuts are planted in hills, twenty-five or thirty feet apart. The young seedlings are allowed to remain in the hills and when three or four years old grafted. This, of course, produces an orchard, and the fact that the young trees do not need to be transplanted, is a decided advantage.

In the grove there is less liability of failure in obtaining a full stand of trees, the loss attendant upon transplanting being eliminated. Often the grove may be started on a hillside which would be worthless for any other purpose. It is not necessary that the growth of native trees be pure. If one tree in three is a chestnut, no more are necessary.

Having selected the area for the grove, work may begin at once, but preferably during the fall and winter months. All trees in the proposed grove should be cut down and the brush burned, leaving the ground as clean as possible. Frequently the lumber removed will more than pay for the clearing. If the selected ground is already waste land, it may be ready for grafting the following spring, or it may be necessary to clean the ground, removing the brush and rubbish by burning. If there is a chance to select the location of the grove, it should be located where it may easily be protected from forest fires. It is desirable to make fire lanes at once, before beginning the grafting. Fire is the worst enemy of the chestnut grove, but by keeping the ground clean, it may be controlled.

Having cleared the ground during the winter, it is necessary to wait one year for the chestnut sprouts to grow before they are ready for grafting. The following spring, which is the second after clearing the ground, the grafting should begin. The sprouts which come from the lowest portion of the stump will become independent trees before those which arise higher up, and, therefore, should be selected. At least two such sprouts, or more, according to circumstances, should be grafted on every stump, and on opposite sides if possible. Both may remain for several years, and if one is found to be superior to the other, the poorer one may be used to furnish scions. The sprouts which are not grafted should be allowed to remain for a few seasons to protect the young grafts from the wind and frost. When the grafts are one year old they should be cut back in order to get a good top. The growth during the first year is usually fan-shaped and will not make the best shaped tree. On the original scion only one or two buds are left, and these grow with surprising rapidity during the first year. When only one bud is left on a graft, it will sometimes make the enormous growth of nine feet without a single branch. This growth is made possible by the established roots of the old stump. In cutting back such a sprout, from three to five buds should be left. This will insure a low crown, which is as desirable in chestnuts as in peaches. In cutting back the young grafts, another supply of scions is furnished. In exposed portions of the grove, the young sprouts are

protected from the wind by allowing the undergrowth to remain when clearing the land for the grove. After two or three years, the grafts are firmly established, and then everything is cleared away. By keeping the grove clean, the harvesting is facilitated, and there is less danger from fire, and the insect pests can be fought with greater ease.

It is doubtful, as yet, whether the growing of chestnuts in "orchards" will pay. Grafted seedlings may be purchased at from fifty cents to one dollar each, and with proper care in transplanting most of them should live. Chestnut "groves" certainly will pay. The call for nuts is at present large and the demand still growing, especially in the Middle West. Prejudice and ignorance are among the factors which keep many from attempting the cultivation of the nut. The American people will soon learn the value of chestnuts, and then the demand for them will increase. We are just learning how to prepare and use the chestnut as food.

In Europe the cultivated chestnut is an important food product, and in Italy, France, Spain and Turkey, it serves as one of the chief articles of food to the peasants, who long ago learned how to prepare it. In recent years much interest has been manifested relative to the commercial value of chestnuts, and there has been a steady increase in the demand for large nuts. These find ready sale, and this fact has encouraged the cultivation of various European and Japanese varieties by horticulturists.

Intense interest is being aroused in Paragon chestnuts and there is a great demand for young trees, so great has been the call for them that I have started a nursery and young trees can scarcely be grown fast enough to supply the demand. In one lot I have 10,000 seedlings, two years old, another plot of ground contains 20,000 seedlings one year old. This last season, 1906, 208 bushels of nuts were buried for planting in spring. The 208 bushels ought to produce 250,000 trees at least.

The demand for the nuts is far greater than the supply. This last year about 1,000 bushels were harvested and this amount would not begin to supply the demand. One carload was shipped to Seattle, at \$5.00 per bushel, F. O. B., at Paxinos, and order after order was turned down because the crop had been sold.

One order was booked in December 1906, for 500 bushels, of this year's (1907) crop, to be shipped to Seattle, Washington, and several other letters of inquiry have been received from all parts of the United States for chestnuts for this year's delivery.

(The discussion of foregoing topic is omitted for want of space.)

Afternoon Session, 2 P. M.

Having called the meeting to order, the President asked for report of committee on nominations, who submitted the following list of officers for 1907:

President—Gabriel Hiester, Harrisburg.

Vice Presidents—Hon. W. T. Creasy, Catawissa; F. H. Fassett, Meshoppen; R. M. Elden, Aspers.

Recording Secretary—Enos B. Engle, Waynesboro.
Corresponding Secretary—Wm. P. Brinton, Christiana.
Treasurer—Edwin W. Thomas, King of Prussia.

The aforesaid were duly elected by ballot.

THE PROBLEM OF THE SMALL ORCHARDIST.

By J. D. HERR, Millersville, Pa.

Classified in respect to the object in view fruit growers are of two kinds. He who grows his product primarily for the general market and is spoken of as the large grower or commercial orchardist, and he who desires his product primarily for home use, disposing of any surplus he may have in the local markets, and who can with equal propriety be designated the domestic or small orchardist.

As Pennsylvania has fewer very large commercial orchards than many other states, ranking below her in fruit growing, so she has a large number of small orchards, the premises without fruit trees being exceedingly rare, and in the aggregate the small orchardist is an important factor in ranking the State third in fruit growing with an annual product worth \$10,000,000.

As the object of the small grower is peculiar, so are his conditions and methods. He is, as a rule, the diversified farmer or the suburban resident, and his time and energy are mainly occupied with other crops and interests. He feels he can not afford to give his best thoughts and most careful attention to fruit trees. Indeed his usual method is to set out an indifferent variety of trees in a lot chosen because of its proximity to the farm buildings or because it is too poor to grow any other crop. No attention is given the orchard until it has reached bearing age, when once a year at the ripening of the fruit the crop is harvested or rather such remnant as insects and fungi have not destroyed. Allow me to say in defense of this system, that it enables the small orchardist to grow a liberal supply of an indifferent grade of fruit for family use at the minimum of expense and was good enough in its day, but like the proverbial dog it has "had its day," and it is but truth to say and I say it with some regret that the time when fruit worthy the name can be grown by such methods has passed by forever.

This condition of things is brought about by the recent invasion of injurious insects and fungous diseases, the most important of which is of course the San José scale insect which is destroying orchards by the thousands and threatening to put the small grower out of business. Some are bravely and intelligently fighting the pests, but many are discouraged with the outlook and have surrendered unconditionally to the enemy, allowing their trees to die or cutting them down without expectation of replacing them, and it will be only a matter of a few years time when, unless householders

take hope, thousands of premises will be without a single fruit tree or ornamental bush.

Thus the small grower is face to face with a most serious problem. Failing to grow his own fruit, how will he secure a supply for himself and family? Buy it you say. That is indeed the only alternative, but it is not a perfect solution. Fruit, as an article of diet, is an absolute necessity to the maintenance of good health. It regulates the body, cools the blood, tones up the system, and is a direct preventive of fevers. When it must be bought it will be considered as a luxury and consequently will not be supplied to the average family with necessary liberality.

The only solution of this problem lies, I hold, in the application by the small grower, of modern scientific methods of orchard practice whereby he can maintain his end of the business and grow better fruit and more fruit with fewer trees at very little, if any, additional expense.

In the hope that a recital of the chief points of the cardinal operations of orchard practice in so far as they apply to the small grower, will add to the numerous successes already attained, thanks to the campaign of education conducted for the past few years by the Economic Zoologist, Prof. Surface, I submit the following suggestions:

Since Pomologists agree there are special adaptations of fruit to soils it is but wise to follow their direction for the small grower as well as for his big brother, the commercial orchardist. Briefly stated the rule of adaption is heavy soil for Pome fruit, (apple, pear, quince); light soils for stone fruits, (peach, plum, cherry, apricot). Of course some of our fruits are very cosmopolitan, as the apple, for example, which can be more or less successfully grown on a large variety of soils, but it still remains that none of them are indifferent to even slight variations in land and whenever there is any choice within the narrow limits of the small orchardist, he should avail himself of the advantage by planting most largely of the varieties best adapted to his soil. When there is no choice then fruits can be made to grow on soils which are uncongenial to them by working them upon adaptive stock. Thus the plum may thrive upon sandy soil when it is budded upon the peach and the pear is sometimes grown on light soils by working it upon the mountain ash. No varieties as a rule should be planted but such as are known to do well in the immediate neighborhood.

In choosing a site or location for a new orchard reference should be had to elevation and exposure, very high hill lands or very low bottom lands are alike unfavorable because of their exposure to the regions of the weather in the one case, and the danger of buds and blossoms to the killing effects of frosts in the other. The choice location being land somewhat elevated above its surroundings and gently sloping toward the north and west, thus insuring both soil and atmospheric drainage as well as retardation of bloom in the spring.

In up to date practice cultivation and fertilization go hand in hand in the production of any crop and are absolutely essential in growing a crop of fruit which is a crop after all the same as wheat or corn or potatoes, and being such it makes the same demands upon the soil.

The benefits of tillage are manifold, the most important of which are: Improving the soil and thus presenting greater feeding surface to the roots, by increasing the depth of the soil, by warming and drying the soil in spring, by reducing the extremes of temperature and moisture, and conserving the moisture by increasing the water holding capacity of the soil and by checking evaporation.

As the tree on account of the enormous leaf surface exhales more moisture than any other crop occupying the same space, the importance of saving the moisture in the soil will be admitted.

It is also demonstrated that the depletion of the land by fruit trees is more serious than by annual crops from the fact that plant foods are locked up for many years in the trunks and branches of the tree whilst a large part of the fertilizing constituents in common crops returns to the soil each year. The orchard requires, if fruitful, plant food equal to value greater than that of wheat. No thrifty farmer would think of trying to raise wheat even on our best lands for 20 consecutive years, though the soil were fitted in the best possible manner yearly, and yet this is the common practice with small fruit growers. Careful treatment in this respect would stir up the dry bones in many an old and unproductive orchard and place it upon a paying basis.

A definite amount of pruning is also advisable. While there is often a conflict of authorities, suffice it to say that trees should be headed low to facilitate picking of fruit and spraying, interfering and other superfluous limbs cut out, and when, for any reason, the tree suffers from injury, it should be cut back to the extent of the injury. By this means all varieties of fruit trees of all ages (except old apple) can be restored as long as they are not absolutely killed.

The one remaining operation is that of spraying, but recently developed, it has become the *sine qua non* of fruit growing, the only means of salvation to our orchards and insurance for our fruit.

For our present purpose we may speak of spraying as of two kinds, viz: Spraying for the San José Scale during the dormant season, and spraying for chewing insects and fungi during the growing season. The lime sulphur wash (1 lb. lime, 1 lb. sulphur to 3 gal. water, boiled 45 minutes); whale oil soap solution (2 lb. to 1 gal. water), and certain soluble oils can be depended upon to control the scale insects.

Paris Green or London Purple are good antidotes for chewing insects including the codling moth, used in the proportion of one pound to 200 gallons water, adding a pound or two of lime.

Bordeaux Mixture is our standard fungicide, made after formula 4 to 6 lbs. copper sulphate, 6 lbs lime and 60 gal. water. The arsenical poison can be added to the bordeaux spray, thus serving two ends with one operation.

A more or less close observance of these suggestions I submit as pointing the way out of our present difficulties for the small orchardist. This is at least no time to be discouraged. I have, myself, met with many examples of successful fruit growing in the counties of Lancaster and Berks during the last year, and we shall not lose our orchards if we apply the same good judgment and intelligence to fruit growing we aim to employ in all general farm operations.

PEACH AND PLUM ROT, AND HOW TO CONTROL IT.

By L. G. YOUNGS, North East, Pa.

Mr. President, Ladies and Gentlemen: With your and the Association's permission, I will take my place on the floor instead of going on the platform. I am a little bit cross-eyed in my hearing, and consequently I will talk down here where I can hear you. Also because I am a little lengthy for this world and I don't think I would add anything to my paper if I were to take my place on the platform.

Your Secretary has given me some idea of your troubles and while I am not able to diagnose your case, perhaps your case and mine have run on parallel lines and my suggestions may be of some little help to you. This is all I ask for and it is all I can hope or pray for.

I have come at the request of your Secretary to tell you something of the methods we pursue to control peach and plum rot over in the region of Lake Erie. Now my observation leads me to believe that most trees come from the nurseries comparatively free from spores of Monilla or fruit rot. If this is the case it behooves us growers to keep them in this condition, if we can.

This world of ours swarms with organisms of higher or lower order. The modern surgeon sterilizes his instruments. By this antiseptic method he is better able to prevent rather than cure disease. What carbolic acid and chloride of lime are to the surgeon and doctor, sulphate and carbonate of copper are to the modern fruit grower.

Now we commence operations in our orchards by first removing the mummies from the trees. This can be done easiest after a rain with a padded mallet or stick. We do it usually in the fall or winter. We are now ready for our spring campaign of spraying, which we commence before the buds are materially swollen by spraying our trees with a strong bordeaux, 25 to 30 lbs. of copper sulphate to two hundred gallons of water. We use a ground lime at this time called Cream of Lime. This is largely used to make the solution adhere to the trees and as it dries we are enabled to see how thoroughly we have covered the limbs and bodies of the trees. We do not use lime at this time to render the spray harmless to vegetation, because there is nothing to injure. We are thorough with this spraying. This is the important spraying. If we can thoroughly sterilize the trees at this time we have laid the foundation for a successful crop of fruit so far as is in our power and on this hangs the law and all the prophets. All our orchards are sprayed at this time: Plum, peach, cherry, apple and quince. Also our gooseberry, currants and last but not least our grapes are sprayed about this time and usually in the order named. This spraying renders the peach practically immune from leaf-curl and the gooseberry largely immune from mildew.

Shortly after the trees are done blossoming we spray them again.

This time using a modified Bordeaux with the Ferro-Cyanide, (Yellow Prussiate of potash), test and using for European plums, 8 lbs. vitrol to the hundred gallons with ten to twelve lbs. lime, and six lbs. arsenate of lead. For peach and Japan plums we use two to three lbs. vitrol, eight to ten lbs. lime and four to six lbs. arsenate of lead. Should rains be frequent we repeat this in a week or ten days with three to four lbs. of arsenate of lead instead of six. After this you will probably find it necessary to use a dilute vitriol water; sulphate of copper one or two pounds, water one hundred gallons, or you can use the Ammoniacal solution of copper carbonate.

We use the weak vitriol water on most all fruits at this time. The danger in using lime is the coloring of the fruits. If you have done your duty up to this time you will not have any considerable amount of rot develop during the ripening of your fruits and this weak vitrol water will keep your orchards healthy.

We use Spraymotor Nozzles. We have found them satisfactory, make a fog or mist and they do not clog when used in connection with our strainer or separator. We use six to twelve nozzles in combination. We use the Spraymotor cut off valve. We are not cranks on this and are not interested in the sale of them, directly or indirectly, or are any of our friends interested in a spray nozzle, but in our business we find it one of the best nozzles we can use.

(Exhibits spraying apparatus). In order to start properly in the spring we want to make it as easy as we can. These are the Spraymotor nozzles we use. We like them because they throw a fine spray and don't wear out very readily. I mean by that, that the hole does not get large and thus make them useless. I want to use a dense spray. This is the smallest cluster and we use them up to a sixteen cluster. Then we want a cut off. The ordinary cut off is this kind (holding it up). And we said some things that came very near to being profanity in the use of that. We have men depending on our expedition at that time and we could not stop it leaking and it drenched those men and therefore is not satisfactory so we have discarded it and come to this (holding up the object). This is the cut off we use now. There is no drip from it. There may be a drip from the cluster, but we have an inverted cup on the rod under the cluster of nozzles, and whenever there is any drip from these clusters it runs out here and drops down and don't drop down on our men. We find it is a good thing. We have tried all kinds of nozzles and after a great deal of experience have adopted these nozzles. In large lots you can get them at quite a large reduction.

Now then we come to another matter, that is we had trouble with these nozzles. They threw rather a fine stream and once in a while they would clog. We then used this separator or strainer. I will unscrew one if anyone wishes to see the construction. While going through the orchard we were bothered so by clogging that we put on this other strainer. This screws into your air chamber, or below your air chamber and the liquid is forced through here and up through here; it is usually shut off like that (illustrating), or opened by this valve to clean itself if it gets clogged. This union here I will take off; that is pretty well worn out. Now, here, this has been screwed

up and here is the sized mesh that we use. Here is a mesh of copper wires, 30 strands to the inch.

Now some years rot is little in evidence and people are apt to relax their vigilance. In fact we have to be brought up with a "round robbin" sometimes before we do our duty. You know that "when the Devil is sick the Devil a monk would be; when the Devil is well, the Devil a monk is he." Spraying is an insurance. I have found spraying as indispensable in raising potatoes as fruit. Our strawberries are sprayed at least once. Melons are sprayed as well, and asparagus beds to get rid of beetle.

We have had but one complete failure of peaches in eleven years. We have not had a failure of plum, European, in seven or eight years. We control the curculio by using arsenate of lead and have dispensed with the Geneva Bug Cart. In 1906 we raised eleven hundred carloads of grapes and had the rot in control at North East.

MR. HALE.—I don't know whether I want to ask any question or not, but I have been very much interested in this paper, and more interested in the rot. I think the greatest menace to peach culture is the rot, and therefore, I was interested in this paper today. My experience today in Connecticut and in Georgia is, that taking all the different kinds of specimens, the best thing to do is to gather them and burn every rotten peach as soon as it gets to the ground, and burn it quick. We have men enough to go over the orchard and burn up every rotten peach, and we were laughed at for doing it. We pick all such specimens on the trees and destroyed them. We have sprayed a very strong Bordeaux or copper-sulphate wash when the trees were in a dormant condition; we have tried spraying with a weakened solution when the trees were in foliage, and while our friend has done it up in a portion of his orchard, and it is in foliage, don't go home and spray your orchard with Bordeaux mixture: If this gentleman has succeeded in doing it, he has succeeded in doing something that, few in America have succeeded in doing. A number of years ago I sprayed an orchard in Connecticut with four parts of copper-sulphate, and twelve of lime, Bordeaux mixture, and it lost all the foliage. It looked as if it would go to pieces, and I just saved my neck by getting my teams and my neighbors, and scattering over the orchard nitrate of soda, and worked on Sunday to bring about a new foliage. It was such a dropping of foliage that the United States Department of Agriculture sent a man from Washington, and I gave them the orchard to make tests, and they used half a pound up to two pounds of copper of sulphate, to ten pounds of lime, in fifty gallons of water, and every one of them injured the trees to some extent, and there were not one of them worthy of the name of a peach tree. I had been since this shy of spraying peach trees and plum trees with Bordeaux mixture. Four years ago I gave the Department of Agriculture at Washington an opportunity to experiment in our Georgia orchard. It cost me three thousand dollars by experimenting with copper-sulphate. I am speaking from the bottom of my heart and pocket book when I say that they suffered so severely and they still wanted to try it. Two years ago the Department at Washington, kept two or three men in my orchard all Summer, and I had them guarantee that they would pay the damage,

and would not take so large a patch. They did it in wet and dry weather, and in every instance they injured the foliage to the great damage of the tree, and I say, if this gentleman can spray his trees in foliage with success, God bless him; go on, but I say don't spray any of your trees in foliage with Bordeaux mixture.

I was glad to hear that our friend gets after the curculio. I have spent thousands of dollars on bumping him off. If you can catch him with arsenic, I would like to see you catch him, and I would like to see the curculio you have caught, but I would say that there has not been anyone in the country, but yourself, to trap the critter, but if you have got on to the job, whether by that double or twisted nozzle that you have, it is God bless you. If you catch him, catch him; I won't butt into the game, but I want to say right here, gentlemen, don't you—don't you spray your Japanese plums or peaches with Bordeaux mixture.

HORTICULTURE AND AGRICULTURE—A COMPARISON.

By D. L. HARTMAN, Etters, Pa.

In comparing these two great branches of husbandry, there is no intent to detract from the one to set in relief, the advantages of the other. So long as the necessities and comforts of civilized existence require the products of both the garden and the field, so long will they stand as the chief component parts of one great industry. But while this is true in general terms, the adaptability of one or the inadaptability of the other to the locality, conditions and circumstances of the individual husbandman may make the question of success or failure largely a matter of intelligent choice between them, or a well adjusted combination of the two. Moreover conditions and circumstances have changed so rapidly through increased population, transportation facilities and new phases of competition, that throughout the greater portion of our Commonwealth, as well as in many other parts of the country, the relative importance of horticulture to agriculture is not gauged by the relative opportunities and advantages they respectively offer, but largely by the proverbial conservatism of husbandmen which impels them to cling to accustomed lines, though all former environments have changed. Thus agriculture coming first through pioneering necessity, followed later, by commercial horticulture, necessarily awaiting the development of home markets or transportation facilities, agriculture gained and now holds a far wider following than their present relative advantages justify.

This is not an intimation that there is lack of either room or favorable conditions for the future development of agriculture.

So wide is our domain and so varied local conditions and circumstances within our borders that viewing the surprising results both

in production and profits obtained by masterly management on limited areas both in horticulture and agriculture in various sections of the State, it becomes evident that over the vast expanse of the Commonwealth, in her fertile plains, her sunny slopes and sheltered valleys, there are possibilities of development along both these lines, which compared with the present, though creditable showing, make it appear insignificant indeed.

Thus there is no lack of opportunity, but a general failure to fully grasp opportunity by proper adaption. Take for example, conditions here as they exist around the Capital City, which has grown within a century from little more than a village to a prosperous city of goodly size, and vigorous growth, a growth that is adding thousands to her population every year. What changes have taken place in the production of the rural surroundings to meet the demands of these changed and still changing conditions? In the long ago, the villagers were supplied with fruits and vegetables from the surplus products of the surrounding farmer's orchards and gardens, which were primarily intended for home supply. And so far as home-grown produce is concerned, the city must largely depend on that uncertain supply and quality still. The local fruit growers tributary to her markets, making a specialty of the business, may be called off to the fingers of a hand; and while the growers of small fruits and vegetables make a better showing, the supply of first-class home-grown products in these lines is seldom equal to the demand. So day after day throughout the year ear-load after ear-load of high priced horticultural products of every description arrives from the North, South, East and West, while on every side fine fields of fertile soil in great variety stretch away into distance. These are mainly devoted to hay and cereals as of yore, with possibly an average annual value of twenty dollars per acre, while much of this same soil might just as well be devoted to horticultural crops worth ten times as much. It may be urged, that this is one of the State's most favored agricultural regions. From a geographical survey that may be true; but it is no less adapted to horticultural pursuits and from the import-view-point of demand and supply, and returns for labor involved, the advantage has long been with these. The same general tendencies everywhere prevail, and in many localities the importance of proper adaptation is even more urgent than here. In naturally less favored sections, there are many whose holdings are small or ill adapted to the use of modern agricultural machines. These feel most keenly the competition of the mighty harvests of the Western plains brought to their doors by transportation facilities which they have failed to use advantageously themselves. To them, periods of unusual prosperity may bring, temporary relief, but in the main they are prone to mourn the loss of old time prosperity, all unmindful of the array of new and greater opportunities that have sprung up all around, because they cannot or will not think of deviating from their beaten path. So year after year they plod on, in a half-hearted discouraged way, and their sons seeing no hope in their father's calling, go off one by one to join the crowded city's throng.

The last census shows that during the previous decade, while the increase of population in cities and towns of the Commonwealth was over thirty-four per cent, the increase of her rural population

was only a little more than one per cent.; some districts showing an actual loss. The tendency still remains the same. With such mighty increase of population with consequent increased demands for the necessary products of the soil, why need the husbandman leave the freedom of his open fields, his orchards and his garden? Can there be any logical economic reason why he should? Is not the main reason why he does, the fact that he does not discern his opportunities? And why fail to discern? Partly because they have come so suddenly. In all ages the peculiar environments of his occupation have tended to make the average husbandman adverse to change, and never in history, in any land, have changes been wrought with such marvelous rapidity, transforming a continent, within the span of a few generations, from a trackless wilderness to approximately the conditions of a civilization of a thousand years. Though the American farmer shares this spirit of progress, for his proper adaptation the pace has been too fast. Then too, the very conditions under which agriculture was taken up in this new land, tempting to extensive culture rather than care, have tended to produce slipshod methods, that have all too often been transferred to horticultural lines in which the first conditions of success are intensive culture and scrupulous care. Inevitable failure has been the results, followed by further distrust of all innovations, and a disposition to leave the soil entirely rather than attempt the culture of crops that are new.

Gradually though slowly the increasing relative advantages of horticulture are being recognized, through increasing demands in the vicinities of local markets. . Slower still and more scattering is the perception of wide flung opportunities for commercial horticulture in all its branches, due to the extended and ever extending transportation facilities, and the comparative proximity to a large number of the great markets. Some of these opportunities are full fledged but largely ignored; while others are possibilities that might readily be developed. That is there are lines of transportation that having a scattered patronage of horticulture are furnishing prompt service for perishable goods; while others which would gladly furnish such service were it only worth while are awaiting the call.

In a few localities like the grape district of the north-western and the important apple and peach district in the southern parts of the State, and in several scattered, less important centres of various products a few able leaders discerning the special adaptations of locality to crop, have so thoroughly demonstrated the opportunity as to induce a considerable following. But scattered all over the Commonwealth are numerous localities just as well adapted to these or other valuable horticultural products awaiting a leaders demonstration. Thus in practically every portion of the State there are many engaged in agriculture with slight original local advantage or with past advantage lost, to whom, horticulture offers and will probably long continue to offer undreamed of opportunities.

(Mr. Hiester in the Chair).

THE PRESIDENT.—Any remarks on this paper, or any questions desired to be asked? The subject is before you, if you have any remarks to make.

We have with us the delegate from New Jersey State Society, whom I would like to introduce to this audience. I would like to hear a word from him, if he is present. I refer to Mr. Barton.

MR. BARTON.—Mr. President, Ladies and Gentlemen, of the Pennsylvania Association: It is a great pleasure to be with you. It has been a very pleasant and interesting meeting, and if there is any one point, more than any other, it is the strength you have shown in your discussions. Everyone seemed to be willing to talk and willing to stand by them, more so than in our New Jersey Association. You men are specializing on the apple; a few men on the peach business, and that is in striking contrast to our conditions at home. In our little State we have the greatest variety of callings. Our men do what you are doing. There, we have one big strawberry man, and in the same neighborhood a big peach man, and possibly a big apple man, and our meetings are up against the different interests, and for that reason our meetings are not as much centralized. We have meetings dealing with all fruits from the cranberry down; therefore, I don't think we maintain the same interest in our meetings as you do in your meetings, and as I have said it has been a very great pleasure to be with you, and I shall report to our society what an interesting association you have here.

THE PRESIDENT.—We have a few delegates from our local County Societies, and I would like to hear what they are doing. I would like to hear from Mr. Fassett, of Wyoming county, one of our new members.

MR. FASSETT.—Mr. President, and Fellow-members of the State Horticultural Society: I assure you it affords me much pleasure to meet with you. My society sent me down here, not to make a speech, but to use the lead pencil and my brain, and bring back some facts that would be a benefit to our society at home.

We, in Wyoming county, are more particularly interested in the growing of apples. We seem to have conditions there that are favorable to the growth of apples, and particularly the Northern Spy. We think we can produce this apple to perfection, and possibly with the assorting and care that Brother Hale recommends, we might be able to get three dollars a basket for them.

We are practically only a new society in Wyoming county, having been organized about two years. Conditions there were such that we saw we must do something to awaken our people to care for their orchards, because of the San José Scale having made many in-roads in our county, and to Prof. Surface, we must give much credit for awakening our people to fight the pest, and save our orchards, and I want to say that we can't do too much for Prof. Surface, and I hope he may be retained in office.

I thank you for requesting me to come here, and I feel confident that I have received very good facts here that I will be able to take home, and I know our society will be benefited.

THE PRESIDENT.—I want to say one thing, and that is, that the Wyoming Society should meet oftener. They should meet every month.

I want to hear from Adams county. I will call on Mr. Elden, President of the Adams County Fruit Growers Association.

MR. ELDEN.—Mr. Chairman, and Fellow-members of the Horticultural Society. This is very unexpected to me, as I expected Mr. Tyson to speak for our society. We organized about three years ago, and have about one hundred members. We are not what is called co-operative; we have no time to sell or buy anything co-operatively, but we are rather united for the purpose of fighting these pests. If we know anything, or are persuaded that we know anything, we are to first tell that to everybody that we reach, and that is a criticism of one or two organizations whose proceedings they seem to hold back. We are very anxious to pass it along, and that I think is the life of the county organization. If we have something in our practice that is to us apparently of more value than that which is on our program, we let our program go, and take up this other matter. Our program is a secondary matter, and we let it go.

We come from the land of the York Imperial apple, and it will be heard from. Our products, as yet, are not very extensive but we are expecting great things from new plantings. We expect also to plant some Stayman Wine-Sap, Grimes' Golden and Jonathan.

I am glad to meet with you, and I want to say if there are any gentlemen who contemplate organizing, you can't get together too early. Get together in a house and organize. Some of you gentlemen, perhaps, could buy a house, and you would have a place to meet. Meet once in a month, and meet on a Saturday night, and we invite all of you to come and meet with us. We had our second annual convention in December.

THE PRESIDENT.—Mr. Lee, can you tell us anything about that Bedford County Society.

MR. LEE.—Mr. President, Ladies and Gentlemen: We have a small society in Bedford county of about thirty-two members organized some two or three years ago. I think they met once, and elected their officers, and that was the last meeting they had. At that last meeting, a State Board member came and myself and one or two others, and we tried to re-organize the association, and after I moved back from Harrisburg, I got them together, and got the society re-organized, and got it moving along for two or three meetings, and the officers did not turn up and I thought the association was going to die again, and last Saturday, the Corresponding Secretary, not being satisfied with the association going back so soon, called on me and said I should call a business meeting, that he had some resolutions to adopt to be sent to the Department at Washington, and the program was announced, and I suppose we will go on as we have heretofore. We generally meet the last Saturday of every month. We had several good meetings, which were of an instructive character, and were very well attended, and it certainly looked bright, and I will do all I can to try to get the interest stirred up, because there is a whole lot of fruit raised in Bedford county; more than people have any idea of. It was estimated that two hundred carloads were shipped out of Bedford county last year, and we did not have a very large crop. I know they have three

packing establishments there in Bedford, and they are all full. Dr. Gump is supposed to have six thousand bushels; S. B. Brown has quite a large amount of fruit. His trees are young. There has been a good bit of heavy planting done. I believe one man is going to plant very shortly something like one hundred and fifty acres, and he is going to plant it in apple and peach. He intends planting something like thirty-five hundred peach trees, and expects to get a soil survey by the United States Department of Agriculture, which I think will stimulate more interest in fruit culture in Bedford county than anything else, because our land is well adapted to that purpose. I don't suppose there is anyone there who has more than four or five thousand trees, except what this man is putting in. I suppose there must be twelve or fifteen persons who have from three thousand to thirty-five hundred trees planted, so that in a few years there is going to be quite a number of large orchards.

I am also inspector and demonstrator for that section. We have some scale down there, and out of eight hundred orchards I examined, I found three hundred and forty that had infested trees. I hope we can have an annual meeting at Bedford next year. We are going to make quite an effort to accomplish it.

The only thing I am sorry for is that the Home Society is not here so as to see what might be possible at the meeting. It did not seem possible to send any delegate to the Adams County Association, but I hope by another year we can get some delegate to attend that meeting.

Thanking you for your kind invitation, I will give way to someone else.

THE PRESIDENT.—We have one more report, and I would like to hear it; it is the report of the delegate we sent to the New Jersey Association. I call on D. M. Werts.

MR WERTS.—Mr. Chairman, and Fellow-members: It was one of my pleasures to be one of two delegates to be sent to the Trenton meeting of the New Jersey Association. I want to say it was a pleasure and benefit personally, and I wish it were possible to transmit that benefit to each and every member of this society here. I must say they had a very good meeting. The conditions are different from our State, and especially are the conditions different somewhat from our State, on account of the northern part being more interested in fruit, and the southern part being more interested in vegetables, and being interested in reaching the markets, not through transportation alone, but in delivering them personally to the common market in Philadelphia. Of course, it is true that the city of Philadelphia, that belongs to our State, is a market to the New Jersey growers of products, and doubtless much more so than it is to Pennsylvania.

We observe that they were wide awake, and up to date, and understood the manner of fruit growing, as well as trucking.

There were a number of growers there who are extensively in the business, and who are able to talk of it not only from a theoretical sense, but with the knowledge that comes from actual experience. It is one thing to know it, and still another to practice it, and still another thing to produce it with success, and I believe in many

cases we should pattern after our brothers across the river, and in doing so, it would result in profit to us.

It was a very pleasant trip, and we were very glad to have been honored by an election as delegate from your society. I hope in some way we may be able to give you some of the benefit that we derived ourselves.

MR. YOUNGS.—I want to say that I am a member of the Erie Horticultural Society. I don't know whether you feel like making a visit so far away, but I want to extend to this Association, and its members, a very cordial invitation to come over to our place. We have plenty of hotels to take care of you, and we would like to see you. You will find our latch string is out. Of course, it is a matter of three hundred and fifty miles over there, but you can get a reduced rate, and we can also have a side trip and go down through the Chautauqua grape belt region. It would be a delightful place to meet.

THE PRESIDENT.—I am very sorry the gentleman was not in the room when the question was up for the selection of another place. We had only one invitation. I have been in that farming community, and I would like to see this association meet in Erie, for I think it would be a good thing. They have been in the business of growing fruit for many years, and can give us a great many points as to fruit growing. I hope Mr. Youngs will be at our next meeting, and extend that invitation to us, for I think it would be of great advantage to meet there. I don't think it would do us much good to go to Niagara Falls, because most of us went there on our wedding trip, but to go through that great Chautauqua grape belt would be of great benefit.

MR. YOUNGS.—If you feel inclined to come and meet with us a year from your next meeting, you can come, whether we are here or not. You can correspond with us, and we will respond.

RECENT DEVELOPMENTS IN SCALE REMEDIES.

By PROF. H. A. SURFACE, Economic Zoologist, Harrisburg, Pa.

It strikes me that it is unnecessary to speak at length on this subject when I am publishing in my bulletins each month the latest and most reliable facts that are to be obtained concerning it. These bulletins are sent free of charge to all who are interested in them and extra copies are kept for distribution among people who make special calls for them. The formulae are there printed in detail and it would be better to use them than to have me here repeat what they contain.

I am trying to find time to boil down and print the result of our experiments with the various materials for the San José Scale, especially the latter results with commercial insecticides. It is my intention to publish this in the February Bulletin, as that issue is always on scale insects.

A year ago I read a letter from one of our inspectors in Centre county; in this he outlined the conditions as he there found them and showed that there existed a scattering infestation of the San José Scale with very great indifference on the part of tree owners as to the result of the presence of this pest. However, by our work, including my own individual efforts and lectures in that county, many of the farmers and fruit growers were awakened to the importance of doing something and took action. It is now interesting to see the results of that start made a year ago. I have before me another letter from the same inspector concerning his second trip to the same region but written one year later. This was not written with a view of publication and is a sample of the bona fide correspondence and reports sent to me by our inspectors and demonstrators re-grading the practical work we are trying to do in the different parts of this State. The letter is as follows:

"Rebersburg, Pa., August 29, 1906.

"Prof. H. A. Surface,

"Harrisburg, Pa .

"My dear Prof. Surface.—On my way to Pine Grove Mills on Monday I took a day to go to Rebersburg to see what results the work of last December was bringing. I was very much pleased with the results and found that a large number of men had taken up spraying. I also looked for the spread of the scale and found that where men had not taken any precaution the scale had spread very badly. Along this line I would cite the case of Mr. ———, orchard, about one mile west of Rebersburg. Last December I found one tree or so on which a few scale could be found. Yesterday I found at least twenty-five or thirty trees infested in the neighborhood of this one. Mr. ——— did not spray his trees but I am convinced now he will spray as soon as he can. Mr. ———, remarked after we left last December that we were only going about the country trying to scare people into spraying so as to make sale for pumps, etc., and that he would not be scared into it. I believe he now see the importance of our work. Very different from this is the case of Mr. Charles Bierly, of Rebersburg. He has an orchard of nearly eleven hundred trees. Last fall we found scale there, some trees being badly infested. He secured a good spray pump with all necessary attachments for successful work and sprayed this entire orchard. He practically rid his orchard of scale, besides cleaning up his orchard in good style, making it have a thrifty good appearance and quite a sprinkling of nice perfect fruit, which is rare in this locality. Mr. Bierly is now a thorough convert to the spraying and lime-sulphur-salt doctrine and tells me he will spray regularly. He tells me the entire cost of spraying his eleven hundred trees was only about thirty dollars.

"The only trouble I find in the prospect of spraying is that so many of the citizens of Rebersburg, who are interested in spraying, are purchasing "tin cup spraying outfits" instead of good substantial

outfits wherewith they might do successful work. But nevertheless even with their "tin cups" they are doing some good successful work and many trees in Rebersburg have taken on a new lease of life. Some trees that were almost dead are now thrifty and as a result I could name a score of men here who are thoroughly convinced of the benefits of lime and sulphur.

"Very respectfully yours,

"Charles A. Heiss."

A Member.—What age were the trees that were sprayed at a cost of only thirty dollars for eleven hundred trees?

PROF. SURFACE.—I do not know but they were bearing trees.

MR. HALE.—What kind of trees were they?

PROF. SURFACE.—He does not say but I think they were comparatively young trees.

Now I am to speak a few minutes about scale remedies. We have all shades or grades of degrees of efficiency from those which are absolutely worthless to those which are very good under some conditions. I feel it my duty to give expression to the results of my investigation of a material called "Scale-kill" made and sold at Waynesboro, Pennsylvania. It is a powder intended to be put into holes bored into the trees. I had it analyzed and found it to consist of powdered sulphur, rosin and gun-powder. It cost the manufacturers, perhaps, four cents per pound and they sell it at one dollar per pound. After I made a conscientious effort to learn if it would kill San José Scale, and found that it would not, we inspected several trees where it had been used and found that fruit growers were likewise having no satisfactory results with this material. I learned that the originator has sold his claim to a local druggist and moved west. It is still being made and sold there and sent into different counties of the State and different states of the Union. One dealer in Chambersburg said that he sold forty pounds in one week. The makers claim that the reason it has not previously been successful is that the holes in the trees were bored in such direction that instead of settling out and resting on the sap wood, where the growth takes place, it settled in toward the heart of the tree and consequently was not taken up into the circulation with the sap. They now say that the thing to do is to bore the hole upward at an angle and put the powder in and then cover it with a piece of tin or something of that kind and let the material slide outwardly in the hole far enough to let it rest on the sap wood, with the thought that it would be taken up with the sap.

I should mention another material, namely: caustic soda dissolved in water which was brought into prominence in this State by publication in a very reliable agricultural paper, namely: The Farm Journal, by the publication of a prize article on the San José Scale and its remedies. Practical men have told me that they have lost their fruit and trees by depending upon it as it did not kill the scale.

Another preparation which was given considerable attention in Delaware was "Limeoid" which is a kind of kerosene emulsion made by stirring finely powdered or selected lime into kerosene oil and then mixing it with water. It was then to be sprayed on the trees

to cover them entirely the same as other proposed remedies. The principal here is that each grain of lime was coated with a film of oil and thus the lime was heavy enough to hold the kerosene down in the water and made it appear like a kind of an emulsion but the difficulty was that the same law of capillary attraction which made the film of oil and encircled the grain or speck of lime prevented it from spreading fully over the portion of the branch or twig it touched because it would not all leave the lime particle; some encircling this while a portion of the oil spread to the tree but did not give full effect.

My views today of the San José Scale and the best remedies of it are pretty well expressed in my bulletins and yet I feel like going to every source possible to obtain accurate information that will be helpful to myself or the farmers of this State in this regard, consequently I read from a bulletin by the State Board of Entomology of Georgia and prepared by Prof. R. I. Smith, the State Etomologist of that state.

I must say that I fully endorse the summary here given by Prof. Smith, in practically every point. He says: "Badly infested orchards should be sprayed twice; once in fall and again the following spring." I think that is very important. "Orchards which cannot be sprayed twice should be given one thorough spring spraying. Large orchards will have to be partly sprayed in fall or winter."

This is because it is impossible to get entirely over such orchards during the spring time alone. The reason also for this is that the best possible time of the year to spray is just before the buds burst. If the lime-sulphur wash be put on thin the leaves will soon appear and cover and protect it and I have seen it remain on the branches in December. I wish to pause, in my reading here, to say, that many people ask me if I cannot spray only the trees that are infested and let those go upon which no San José Scale is seen. I must say that this method should be avoided and if there be only one infested tree in the orchard all others should be sprayed as a means of precaution because it is possible for the scale to spread from this tree to another perhaps a quarter of a mile away. It usually spreads to the adjacent trees gradually but quickly.

"In such cases spray the least infested portion in fall or winter, and the worst infested portions of the orchard in spring. Or better yet, spray the worst infested portion both fall and spring. Convenient, serviceable boiling arrangement must be provided for boiling lime sulphur wash."

I find one of the most convenient as well as cheapest methods of boiling this wash is to build a sheet iron vat shaped just like the lid of a paste board shoe box with the edges turned up at the sides and ends. Building this up with boards at the sides and ends, nailing the sheet iron to these boards and make it all tight enough to hold water. It is the cheapest thing you can get for boiling the wash quickly and easily and will last a long time. Such a vat or box can be placed over two stone walls for support making thus a kind of furnace into which rough or old wood can be pitched to keep up the boiling. If you have an engine that will furnish live steam and wish to boil by this method it will be perhaps the cheapest and best way of boiling the lime-sulphur wash. Conduct the end of the steam pipe to the bottom of the barrel, tank or vat and put into it

the lime and sulphur and water and turn on the steam and let it boil for the full length of time desired without even being obliged to stir it.

It will surprise many to learn how long galvanized iron lasts for this work, while copper is destroyed at once by boiling material in it, we find the galvanized iron does very well during several years if not permitted to rust out. One of the demonstrators had a galvanized iron hog scalding which he used as his boiling kettle and from the satisfactory results with that we took the hint and constructed several such tubs for use in our experiments because they were lighter and more convenient than iron kettles could be which were of such size as to hold the same quantity.

"Steam boiling outfits are most desirable when considerable quantities of lime-sulphur wash must be made."

Where a person desires to make a small quantity to use on a few trees either with a paint brush to cover the trees thoroughly from top to bottom, by painting or with a spray pump, he can easily do this on his kitchen stove by opening the windows and boiling the material in an old tin pan or even an iron dinner pot. In fact the vessel will not be injured for domestic purposes by putting it temporarily to such use. I don't want to give the impression that the lime-sulphur wash is absolutely necessary for the stamping out or the control of the San José Scale. Persons can use successfully other insecticides such as kerosene emulsion, twenty-five or thirty per cent. or whale oil soap two pounds in one gallon of water, or some of the good commercial insecticides that are on the market and are well recommended by reliable persons.

"Iron kettles may be used for boiling small quantities of lime-sulphur wash. When such kettles are used set them in a brick arch. Spray pumps capable of giving sufficient power to throw a strong spray should always be used."

This comes back to Mr. Heiss' so-called "tin cup" sprayers and their inefficiency and unsatisfactory results.

"Whenever more than a few trees are to be sprayed, it does not pay to attempt to use small, cheap spray pumps. Thoroughness in spraying is necessary in order to secure satisfactory results. This rule applies no matter what mixture or solution is employed for spraying the trees."

I have made a special study of the causes of failure in spraying for San José Scale, and the chief cause in most cases is the lack of thoroughness of application. This must be emphasized. Whatever material is used, should be applied thoroughly from the tips of the highest branches entirely to the base of the tree in a double coat, or two good, thorough applications, one following the other as soon as the operator may wish to make it, or in case of use of any material that leaves a stain like the lime-sulphur wash. The retouching spray can be given at any time after the first coat is dry enough to let the operator see what spots were missed the first time. In Franklin county many of the fruit growers were becoming discouraged and, in fact, disgusted with the lime-sulphur wash, saying it did not kill the scale on their trees. By personal examination I decided that this was due to lack of sufficiently thorough application and to giving it a final and complete test. Mr. Clayton Miller, of Marion, sprayed his apple trees five times, one after the other, for the sake of thoroughly covering the bark at every place. On the 6th

day of last December he reported to me that the results of this work last spring were highly successful and eminently satisfactory.

MR. HALE.—That is true. The chief feature of failure is a lack of thorough application or failing to cover the trees entirely.

A Member.—Does it make any difference what kind of sulphur is used?

PROF. SURFACE.—We shall come to that in a minute as it is mentioned further on in this bulletin. It is all right to ask those questions but the author says here something about the sulphur which we shall soon discuss. "The lime used in preparing lime-sulphur wash should be calcium lime instead of a magnesia lime."

You who have not read my November and December bulletins will consider this a new point but it was there discussed and I there said it should be calcium lime instead of magnesia. I think the reason for this, is that the calcium is much stronger or more caustic while the magnesia is a nice mild white lime which when combined with sulphur makes a mixture of different color but not so strong in its killing effects on the scale. In boiling the wash, the operator can know whether he has calcium or magnesia from the color it assumes when cooked nearly an hour. The calcium mixture becomes the color of tomato catsup or boiled tomatoes, and cannot be cooked to the point of changing on to a dark olive green color. While magnesia lime may become first the color of cooked tomatoes but will later change to a dark or dirty olive green color, although it does not always pass through the red or tomato color stage.

A Member.—Where will we get the best quality of lime in Pennsylvania for spraying purposes?

PROF. SURFACE.—I find that the York lime is a good calcium lime, while much of the Chester county lime is magnesia.

I believe the next important problem my office should take up is a study of the limes of Pennsylvania in relation to this point and their efficiency in making good material that will kill the scale. Many of the limestones of this State contain both calcium and magnesia and consequently we may get the red color before the olive green, or we may get a combination or mixture of the two. This is a question pretty well discussed in a West Virginia bulletin and any person can get it free by writing for it to Morgantown, West Virginia.

A gentleman from New Jersey.—We get a coffee colored mixture when we boil lime. I have been brought up on that quality of lime. Am I to understand that we are wrong?

PROF. SURFACE.—The coffee colored mixture would not be so bad as it indicates a mixture of both lime and calcium in the limestone with doubtless enough calcium to bring good results. "Sulphur may be purchased in different forms but the grades most highly recommended are 'flour' or 'flowers' of sulphur." The flower of sulphur is ground sulphur from cakes which have been melted and allowed to cool and thus harden. It is not as finely divided as that form called the "flowers" of sulphur which is prepared by sublimation or heating the sulphur and driving the fumes against the walls of the room where it collects by settling the same as soot or lamp

black on the inside of a lamp chimney. A difference of boiling ten minutes will dissolve the "flour" of sulphur as perfectly as the "flowers," meaning that the former may require just a little longer on the same principal as it takes slightly longer to dissolve coarse salt than the fine, but an hour of hard boiling is sufficient time for either kind.

"Self boiled lime-sulphur washes may sometimes be used with success, but they are not recommended for general use on account of the extra expense involved."

The self-boiled wash is where caustic soda or some other material is used to produce artificial or chemical heat, but this is very expensive and requires more care than the boiled lime-sulphur wash and does not increase the killing efficiency of the mixture. It only overcomes the necessity of fire and a kettle for boiling because it can be made in a barrel if this be covered with blankets to hold the heat.

"The addition of tar, potash, lie, copperas, bluestone, or any other substance to the regular lime-sulphur wash, does not appear to be necessary or desirable on account of mixing the mixture more costly."

This is because the boiled lime-sulphur wash is itself a fungicide and appears to be fully as efficient alone as it can be made by the addition of those other substitutes.

Experiments conducted by individuals often result in valuable discoveries. Fruit growers are urged to make experiments with any remedy for San José Scale, but to do so on a conservative basis.

The importance of this is illustrated by the result of a fruit grower, who writes in a recent agricultural publication that he dipped three thousand trees in lime-sulphur wash, probably hot, and killed them. It would have been better had he experimented by dipping perhaps ten and waiting to see the results of such treatment. I do not, by any means, recommend any new scheme, project, method, nor material on an extensive plan because of the great loss that may come if this should fail.

MR. HALE.—I have dipped thousands of them in a cold mixture and it did not kill them.

PROF. SURFACE.—Did you dip the roots also?

MR. HALE.—No sir.

PROF. SURFACE.—"The San José Scale may be kept in control if all who have infested orchards will apply the remedies recommended."

Now, friends, I would not hesitate to plant an orchard either with or without infested trees in the heart of a badly infested district, and under such conditions should not at all feel it obligatory upon my neighbors to treat their trees as far as the safety of my own would be concerned.

A Member.—You can't keep it off the tree?

PROF. SURFACE.—To a very considerable extent.

A Member.—If a neighbor has the scale on his trees it will get on your fruit?

PROF. SURFACE.—Not to great extent. If I spray my trees I do not believe it is possible to wipe it out entirely, but if we can control it so as to produce first class fruit, in spite of its existence, we shall be as successful in commercial fruit growing as though it were exterminated.

"It is better to spray orchards from one end to the other when only a few trees are actually found infested, and thereby prevent injury, rather than to delay the spraying until the orchards become badly infested by the scale."

Now I had hoped to give you at this time the results of our tests of different commercial insecticides, but we have not quite finished the study of the field notes on these, although they will be published in our next monthly bulletin. These results, however, are so well expressed in the New York bulletin, which I hold in my hand, that I shall read it to you and give you my sentiments. This is from a summary of a series of extensive experiments with commercial insecticides, published in Bulletin No. 281, of the Geneva, New York State Experiment Station. It may be obtained free by writing for it. Prof. Parrott, summarizes his experiments and I shall read you less than a page of his conclusions.

"This bulletin contains the details of a number of experiments with commercial miscible oils to determine their merits for the control of the scale. This work was conducted in three orchards in which 1,368 trees were sprayed with these preparations in various proportions. On the basis of these tests the following conclusions are drawn:

"Applications of proprietary miscible oils at the rate of one part of oil to twenty or twenty-five parts of water, fail to give uniform results on scale. Trees receiving these treatments usually showed more or less spotting of the fruit and varying infestation of the new growth.

"Miscible oils in the proportion of one part of oil to ten or fifteen parts of water, while uniformly more destructive to the scale than the weaker preparations, were usually not quite so efficient as the boiled lime-sulphur wash. These stronger applications destroyed large percentages of the scales, being sufficient effective to maintain the thriftiness of the trees and to keep the fruit crop fairly clean. On the basis of these results even the better ones of the miscible oils tested should not be used in weaker mixtures than one part to ten or fifteen parts of water.

"The miscible oils are commercial insecticides and therefore the orchardist should understand that the reliability of the stock material rests with the compounder. These sprays are simple to prepare for use, and are convenient preparations for the treatment of old trees and small orchards."

That is where I endorse them specially as they are easily prepared and applied, if a person should not desire to make the homemade insecticide for use in only small quantities.

"The cost of the miscible oils in the proportions of one part to ten or fifteen parts of water makes their use almost prohibitive for commercial orchardists who desire a safe and comparatively cheap oil spray. Compounds of commercial insecticides should endeavor to produce a reliable miscible oil that is cheaper than present brands."

MR. HALE.—I would like to say a word on this subject. I was particularly interested in the remarks made by Prof. Surface, with reference to the situation in Pennsylvania and his summing up of his results in connection with the use of the lime-sulphur wash. I have had the San José Scale for many years and fought it in various ways. We are always looking for the easy way out. At the present time the people who are exploiting the oils are getting good money from the people because it is the easy way out. If I had two or three trees to treat I would give up the tree if I had to use the lime-sulphur wash, or I would use whalebone soap or oils, but to the commercial orchardist I would recommend the use of the lime-sulphur wash. I have had five hundred barrels of sulphur and boiled it up and there is no question but that the lime-sulphur wash is the cheapest; on top of that it is a splendid fungicide and we get a splendid result there. It also controls the leaf curl and controls the brown rot and all our fungus troubles. On top of that it has a stimulating effect on the growth of the tree. You spray one row of trees with the lime-sulphur wash and let the other row beside it go without spraying and you will see the good effects of spraying. Those are the reasons that would continue to hold me to the use of it.

Now Brother Brown, you say it is hard to get labor because labor is getting scarce, it is getting more independent, but in the last six years I used about six hundred barrels and I never had a man to leave the farm on account of the use of lime-sulphur wash. We furnish them with proper clothing and vaseline to use on their faces, although I would rather go to a picnic than a spraying. There are times that oil will come in. There is a value and place for it at times but it seems to me that its principal place is where the owner has only a few trees. I don't think it will kill the scale as thoroughly as the lime-sulphur wash. I believe the lime-sulphur wash is the best but I do not deny but what the oils will keep it down and there is a place for it on the small orchard and small grounds.

However, it will be a long time before you are able to find anything equal to the lime-sulphur wash to destroy the San José Scale and in the use of this wash I have been impressed with the idea that God sent the San José Scale for the use of the lime and sulphur on our trees on account of their being other good results in connection with the growing of the trees in the use of the lime-sulphur wash.

MR. PRATT.—Mr. Chairman and Gentlemen: I usually refrain from saying anything in a meeting of this character simply because of being the originator and manufacturer of the soluble oils, still I think it is due not only to myself but to other manufacturers of soluble oils that I should say a word.

I believe it has been conclusively shown that the soluble oils, when applied in the right and proper manner, are just as effective as any insecticide we have in killing the San José Scale. This has been proven in the thousands and thousands of barrels of oils that we put out during last year. The question has been brought up in our experiments stations as to why there have been some failures and I have for the past few months been looking into this matter as thoroughly as it was possible for me to do so, and I have been sur-

prised to find out how little we know about thorough spraying, not only in the application of lime-sulphur and salt, but in any of the soluble oils. That has been brought up by Prof. Maynard; he made this remark, that a general application will not do. I have had sprayers come to our office and argue that it would not do. Did you ever see that window pane and the rain spots drip on the panes of glass and how it spread about there? The oil has the same effect when it drops on any surface because it spreads after it drops at any particular point. In all meetings I have attended I find that the question most discussed is the thoroughness of spraying rather than the material you are using. I believe before another year is out we will convince Brother Hale that the soluble oils are cheaper, lower in price today and easier in application, than any other preparation on the market that we can use as effectively against the San José Scale.

It would not have been any inducement for me to go into the manufacturing of soluble oils if we could not control the scale in commercial orchards. Our ambition is far beyond the cleaning up of the back yard orchard. If we cannot do the work for Mr. Hale, and other commercial fruit growers, better than in the use of anything else it would be of no value as a manufactured product.

One other thought I desire to express is this, we do not yet know what the fungicidal qualities of oils are. You remember that this lime-sulphur and salt wash was used for a good many years before its properties were appreciated. The oils have only been out for two years, and as a manufacturer I want to say this, that I have spent night after night in the laboratory working over this matter and we are ready to take up this work. We believe we are doing a good work for the fruit grower.

The question as to the price was brought up and I want to say this, that we have not an agent who does not make more money out of it than we do as the manufacturer. We have 70 per cent. of petroleum oil and 9 per cent. of vegetable, and 8 to 10 per cent. of chemicals, and that 10 per cent. of chemicals cost many times more than the 70 per cent. of petroleum. Prof. Surface spoke of one globule of lime holding a number of globules of oil around it. You remember the petroleum is not acted on as an alkali or an acid, but it will separate from the little globules in the oil and it is in the breaking up of those globules that we are able to make it spread out and cover a larger surface. We feel we have broken is up about five times as small as it was before.

We don't know what the fungicidal properties of oil is going to be. We are working with and for the fruit grower to do all we can. Say what you please about the lime-sulphur wash it is a mean thing to handle and everybody is trying to get away from it.

MR. WOLFF.—I would like to ask these commercial people how they are going to show that these materials can be put on as cheap as the lime-sulphur wash. You can buy sulphur at five cents a pound and lime at about one-half cent a pound, and in making up the different parts it will not cost more than two cents a gallon. Please explain how the material of which you speak is as cheap as lime-sulphur wash.

MR. BROWN.—We will furnish scalecide at fifty cents a gallon delivered anywhere east of the Mississippi River and north of the Ohio and we will deliver it at sixty cents a gallon anywhere in the United States. We guarantee that five gallons of scalecide in ninety-five gallons of water will kill every scale you hit with it. That will cost two and a half cents in this State and three cents a gallon anywhere.

There is one preparation on the market that is almost identical with scalecide with the exception that it has sulphur in it and that is called kiloscale. One gallon will cover twice the surface in spraying with the same quantity of the lime-sulphur wash. The one is a thin watery substance and the other is a whitewash. It may be applied in one-half to one-third the time. In other words, the labor of one hundred gallons of scalecide will cover twice as many trees that you will with the lime-sulphur wash and you will find it cheaper if you figure it out; take a cent and a quarter a gallon for the lime-sulphur wash, because your labor is cheaper. I have never heard of anybody who manufactured the lime-sulphur wash and putting it out for less than two to three cents a gallon and scalecide is worth two and a half to three cents a gallon.

I have had some experience in spraying—having about 7,000 trees—and have been spraying for 15 years. We do commercial work, running a large power spraying outfit, putting out from 35,000 to 40,000 gallons of spray material annually. I travel a great many states—selling spraying machinery and materials—which gives me unusual opportunity for observation and brings me in touch with many of the most extensive fruit growers of the country, by which I am enabled to study their methods. I have used to a greater or less extent, every leading remedy for San José scale upon the American market, have been fighting this pest for twelve years—and my experience leads me to believe that any one of these remedies is effective in controlling the scale, if properly made and thoroughly applied. Some are more dangerous than others. This applies more particularly to petroleum oils, but we are now familiar with their use, so that even crude petroleum can be applied without any danger attending the application. I used the lime-sulphur nearly six years with good results; three years of this time I used the self-boiled chiefly—and with perfect success, so when I hear entomologists and fruit growers say that the self-boiled lime-sulphur wash is not effective, I feel that they do not know what they are talking about. In the use of any of these remedies, success depends entirely upon the thoroughness with which the work is performed. In fact it depends upon the man behind the nozzle.

In Delaware we have practically abandoned the lime-sulphur wash, the same is true of many of the larger fruit sections of the country, not because the L. S. wash would not control scale, but because of its many disagreeable features. Our people are now using scale remedies with an oil base—and since the introduction of the “soluble” or “miscible oils” and their value fully proven, we have abandoned the sulphur washes and have taken to the use of the miscible oils. I do not say this because I am interested in the manufacture and sale of these remedies, but because they promise to control the scale more easily and more cheaply than any other remedy. I believe I am well enough known upon this floor, not to be charged

with recommending anything except what I honestly believe to be the best interest of the fruit grower.

These miscible oils are not expensive, are thoroughly effective, mix readily in water, and if properly applied, will kill scale at the dilution recommended by the manufacturers, viz: One to twenty. When all things are considered they are cheaper than the L. S. wash; they are pleasant to handle, neither injuring pumps or workman, very quickly prepared, never clog pumps or nozzles, and will cover one-third to one-half more tree surface per gallon than the lime sulphur wash. This is not all, for the same force, with a pump using the miscible oils will cover from two to three times more trees in a given time and do it better than with the sulphur wash. This makes it by far the cheaper remedy. I know these may seem like strong claims, but to prove them I here and now challenge any entomologist or fruit grower to a field contest, either in an orchard or public park, and I will prove that these oils, when properly applied, are not only more effective than the L. S. washes, but very much cheaper. Were we able to secure all the evidence, I am fully convinced that a very much larger percentage of those using the oils have been effective in controlling the scale than those who have used the L. S. washes. In my own State the miscible oils have solved the problem. Last week we held a three days' session of the Peninsula Horticultural Society at Dover, Delaware. There were from 600 to 1,000 fruit growers in attendance at the sessions, and in all that time the question of the control of the San José scale was not raised, nor the subject discussed, because our people felt that they had at last found something that would control the scale.

We have used the soluble oils during the last three years, but very extensively the last year with the above result. I have a letter received today from J. W. Killen, of Felton, Delaware, known to many of you as the largest private experimenter east of the Mississippi River; a man who has propagated more new varieties of chestnuts than any other man in the United States. Last spring he had a badly scale infested peach orchard. He says his trees were nearly dead, so that their recovery even with the best of treatment, was extremely doubtful. Both sides of the orchard was treated with Lime Sulphur wash with good results. The center was treated with Target Brand Scale Destroyer with very good results, not only in destroying the scale but the trees where the scale destroyer was used made a larger growth of wood and held their foliage three weeks later in the season than where the Lime-Sulphur wash was used. This would make it appear that the application was beneficial to the trees. An extensive experiment, conducted the past season, in dipping nursery trees before planting, shows exactly the same results as Mr. Killen found. From this it would appear that the miscible oils possess a fungicidal value as well as being a sure insecticide. I feel sure we are just on the threshold of great possibilities with the oil washes, many claim they are still too costly. I contend they are not when all things are accounted for—but if they are, they are the best scale remedy and the best is not always the cheapest so far as dollars and cents are concerned—but measured by final results, they are cheapest. What we want and insist upon

having, is that wash that is the most readily prepared and applied, and is least injurious to spraying machinery, teams and workman, and most effective in destroying insects and at the same time being most beneficial to the tree. Upon this we are a unit—and I believe we have to-day in the soluble oils just such a remedy, and there is abundant testimony from others showing them to be of the same opinion. Therefore I cannot understand why our Experiment Stations and fruit growers too, will persist in recommending that nastiest, mean, contemptible and most disagreeable wash when something better and pleasanter, and, really, taken as a whole, more economical, can be used.

In many places I find that laborers refuse, absolutely, to work in the L. S. S. wash. There was a time when a laborer who refused to do as his employer directed was dismissed, but this is not the case to-day, the laborer is independent and when he refuses to work in the Lime Sulphur wash because of its disagreeable features, we will be compelled to use something else.

Very extravagant claims are made for the Lime Sulphur wash. Prof. Taft, of Michigan, says he can control apple scab with this wash. I cannot believe Prof. Taft meant this, because this disease will attack your fruit at a time when you would not dare treat them with the L. S. wash.

A few weeks ago I addressed a meeting of fruit growers at Kalamazoo, Michigan, and after the address a strenuous advocate of the Lime Sulphur wash stated that he had been very successful with this wash and would continue to use it. He said that about three days after applying it he would go all over his orchard and touch up such places as had been missed, and a week later he would go over it again. That grower told the whole story, but how could anyone having 100 to 1,000 acres in his orchard, go over them two or three times.

It is also passing strange to me that all those who are advocating the use of the soluble oils should be charged with insincerity, or that only those were advocating the use of the oils who were directly benefited by their sale. Should this be true, then with equal certainty could all entomologists and officials be charged with having an interest either directly or indirectly in the sale of lime and sulphur, and cooking apparatus. In conclusion, I am firmly of the opinion, and make the unqualified prediction, that if this San José scale pest will ever be generally kept under control in the United States by artificial means, it will have to be with some remedy having an oil base, and the higher the oil figure, and the freer from deleterious oils the better. A natural enemy in the form of a parasite that will attack and destroy the scale, is still our longing hope.

Adjourned.

Evening Session, 7:30 P. M.

THE PRESIDENT.—The chair announces the following Legislative Committee: Hon. William T. Creasy, chairman; D. M. Werts, H. A. Surface, E. B. Engle.

Chairman General Fruit Committee, C. J. Tyson.

VARIETIES OF FRUIT BEST ADAPTED TO COLD STORAGE.

By GEO. H. MCKAY, Philadelphia.

Mr. Chairman, Ladies and Gentlemen: I assure you it is a pleasure for me to meet with the fruit growers of Pennsylvania. Probably I am one of the oldest men present here, although younger in years than many of you, who commenced to raise fruit. I raised fruit in Maine in 1869, and those trees are still bearing fruit—they are spraying them. I don't know what they are using, but if they lived in Pennsylvania they would certainly have their choice of the different things to spray with.

As you all know, the management and control of fruit has changed wonderfully in the past few years, and one of the important questions that presents itself to large growers of fruits is the question of supplying the people with fruit in the most satisfactory manner, the people in the cities particularly, and how to store away better fruits for these people. One of the prominent necessities was found to be the establishment of cold storage plants, and in that business I have had about twenty years' experience in keeping different food products for the people of Philadelphia and other places.

The keeping of apples in cold storage is only one of the many things that can be kept in refrigeration, and if you could visit one of those large plants established for that purpose, even larger than the Terminal Cold Storage plant at Philadelphia, you would find almost everything raised, not only in the United States but in the world, is kept in cold storage, from the simple fact that if a large supper is given by a millionaire, or any one else that can afford it, they often want a variety of things at a season of the year when they are not growing, and that which comes the highest they want the most, hence immense quantities are being stored for the people in the cities.

The market that I have the pleasure of being connected with covers a block, a space of 350,000 feet being given over to cold storage. We have stored there at the present time some thirty thousand barrels of apples which were raised in Pennsylvania, Delaware and New York. We do not store many of the Western apples; as a general thing they come in crates and do not keep very well with us, although I suppose they have their market for them and do store them in the West.

I wrote something on this subject but it seems to me that Mr. Hale, Mr. Brown and some others copied my speech and as they have gone over this ground so thoroughly it is almost impossible for me to add much to what has already been said. However, I desire to say that in order for a fruit grower or a farmer who raises fruit, to make any money out of the products of his farm or orchard it is necessary to have a good market. You gentlemen know that we all have had experience with the commission man, and we have said that we got little return from him. To a great extent this

has been the fault of the fruit grower because it has been the custom to pack the fruit in barrels; a man comes along and we let him have the fruit at just about what he chooses to give for it, or give the fruit to be sold in the fall when apples are plentiful and bring a low price. I do not say that the commission man does wrong but I say the farmer does wrong in not hunting a market. There are about eight hundred farmers who ship their fruit to our market, and after it is placed in storage they watch the market, and when it reaches that stage that they think they can sell for a profit they come to Philadelphia, usually distribute a few barrels to our commission men and those commission men that can get the best price get their fruit, and in that case they sell directly to the commission men. Usually a commission man is satisfied to buy from a good fruit grower if the fruit grower puts his fruit in cold storage because he knows that that man will be more careful in packing his fruit, and if he can make ten per cent. on his investment that satisfies him. That is one thing we are trying to do in Philadelphia. We are trying to bring the fruit grower as near the consumer as it is possible to do and the nearer the farmer gets to the consumer the more money there is in the business.

In considering the best apples to be refrigerated one must not only consider the variety and quality of the apple, but the temperature, humidity and care of the fruit after it is placed in cold storage. While we refrigerate fruit from nearly every state in the Union, we believe that each location and climate is adapted to a certain variety of fruit. For instance, an apple which thrives well in New York may not do well in Pennsylvania, or one which is raised in Delaware may not do well in this State; therefore it is best for each individual to ascertain what variety of fruit is best adapted to his locality. On that account it is impossible for me or any other man to tell you because there are a great many apples of different varieties raised in the United States, and, as I say, nearly every state has an apple that is best adapted to that locality, and while we store apples from nearly every state I do not think it would be safe for me to say to you what apple is best for storage any more than it would be safe for me to say to you, you should use oil, or lime and sulphur, for the spraying of your trees, from the fact that you might use both with profit.

In giving an opinion, and it is only my opinion, after years of close study and observation, the following apples at the present time are some of the best to be considered as they are good keepers, prolific bearers and bring a good price in our market: The Baldwin, the Stayman, Rome Beauty, Nickajack and Winesap. The Baldwin is considered one of the standard American apples and a long keeper. The Stayman is comparatively a new apple, is large, fine flavored, good cooking and table apple, prolific grower, good color, and is one of the highest priced apples in our market. The Rome Beauty is a well shaped apple, even in size, good color, fine eating and cooking apple and good keeper. The Nickajack is a dark red apple, a long keeper, and sells well. The Jonathan apple which is a well colored apple, not very large but of fine flavor, sold from four to six dollars a barrel up until Christmas. As there are not many orchards of these apples the supply is soon exhausted.

There is another apple worthy of mention, and which is too little

grown, and that is the Nero; that is what we call the Four Hundred apple from the simple fact that the wealthiest people in Philadelphia seem to take this apple for the table. It is not very sour, but a good eating apple, and looks well, sells well, and the supply does not equal the demand.

When refrigeration was first started we knew very little about it, especially the temperature required for the different fruits, and I must say, after twenty odd years of experience in the refrigeration of nearly all kinds of fruits, it seems to me that we know very little about the nature of the apple so far as refrigeration goes at the present day; the same as you, gentlemen, every day learning something new and improving the different methods of culture, marketing and selling of your fruit, so there is always something new to learn about refrigeration; but all these things are advancing very rapidly, and I have no doubt, in a few years from now, if you should take a photograph of the fruit you see here to-day (which surpasses in all respects the fruit of a few years ago), you will marvel at your poor results for I believe the time is coming when you will have more perfect fruit. The land in this section is well adapted for the raising of the highest grade of apples and other fruits and there is no reason why you should not have as fine fruit as anywhere else.

I want to say something about the Western fruit. It has been said it did not pay to plant orchards here from the fact that they are planting so many in the West. I have traveled through the West considerably and I don't think the western people have sufficient apples for their own consumption. For the last two years they have been buying apples in Pennsylvania, New York and Virginia, and have shipped them to Chicago, Cleveland and other Western cities for cold storage; therefore that demonstrates that there is no danger of having too many fruit trees planted in this State.

A gentleman came to my office a few weeks ago who to my knowledge has a hundred trees, bearing fruit about four years. I said to him: "What did you make out of your trees last year?" He said he had eighteen hundred dollars profit from those hundred trees and he was offered more this year for those apples. He was not a man you would call a scientific man but a practical fruit grower.

I believe if the young men of this vicinity and other sections of this State would take these farms and put out apple trees, and put out a good lot of them, properly cultivate and care for them, there is nothing they could get into or do that would bring them better returns than a good orchard. There are very few men who go into the cities that make a success of it; about one in five hundred makes a fortune. In planting these orchards they could make a good living in the country and store up a good sum for old age.

When refrigeration was in its infancy the temperature for apples was not thoroughly understood, and ranged about 26 to 40 degrees, but at the present time they are kept at between 30 to 32 degrees. It is absolutely necessary to have an even temperature and not allow it to vary more than two degrees after the fruit has once become cool. It is also very essential to have the room well ventilated occasionally; otherwise by the close atmosphere in the rooms the flavor of the apple is liable to be lost.

We keep the Keiffer pear sometimes at 30 degrees. You will understand that in a room that is very close, and no circulation of air, the freezing temperature of the air is about two degrees higher than it is out of doors. At first we kept apples at 38 to 40 degrees, as I have said, and butter was kept at the same temperature. I mean to say when artificial refrigeration came into existence. I do not mean a room kept cool by ice and salt. At the present time butter is kept from zero to five degrees below and eggs are kept at from 30 to 32 degrees. If you go in a restaurant in any large city and order ham and eggs you usually get refrigerator eggs, and they are much better than those eggs you buy in the stores. I had a Bartlett pear here with me; that pear was kept at from 30 to 32 degrees. We wanted to see how cold we could keep that pear without it being frosted. If you put frost into a Keiffer pear or Bartlett pear, or any pear, you will ruin it. You can freeze an apple and if you hold it at that temperature a certain time, take it out of the refrigerator and place it at about 40 degrees, keep it there about 24 hours, that apple is not injured, apparently. It will not keep as long as it would if it had not been frosted but it will not injure it for a few days.

I suppose I should not speak on any subject than apples, but as you gentlemen have had some liberty on other things I will say a word on the Keiffer pear. The Keiffer pear, some 13 or 14 years ago, when I came to Philadelphia, was condemned by nearly every one that raised them, and the refrigerator men were equally opposed to them, and thousands of trees went out of existence on account of everybody giving the fruit a bad name. We had a few men store their pears with the understanding that if they could not get out with their freight we would not charge them anything for storage. At first we had them at 38 degrees, and when they came out they came out with a black heart. We discovered that they were too ripe when put in storage, were not put in storage early enough, and after a while we run the temperature down to about 30 degrees and found they would keep very well. We also discovered that they would shake the fruit from the trees and in falling from the trees would be slightly bruised, which would cause decay, therefore hurting the Keiffer pear very materially as far as marketing them was concerned. At the present time, however, I suppose we store from thirty-five to forty thousand packages of the Keiffer pear during the year, from half a barrel to a barrel, nearly hand picked, and as Mr. Hale said about picking other fruit, they make three pickings. They pick the large fruit first, before they are over-ripe, send them away to cold storage, and gradually get the whole crop stored away.

Last year was a good year for any man who had apples to store away, or almost any fruit, and this year is equally as good as far as the pear goes. A large lot of apples have been on the market and prices have been very low for poor fruit, but a number one fruit will bring nearly as much in our market now as it did last year at this time. The Keiffer pear was brought into the market and shipped to the West. They sold from 15 to 20 cents a basket. One gentleman hauled his pears to the depot in the fall and got 20 cents a basket for them, and the party he sold them to received day before yesterday, \$1.10 a basket for them, F. O. B., Philadelphia.

after being in cold storage three months. Some of our apples were sold this fall for \$2.00 a barrel, and last week some of those apples put into cold storage, from the same orchard, sold for \$5.00 a barrel. This is one among the many experiences that come up every day, and I have often wondered why you gentlemen who raise good fruit, and you raise it to make a few dollars, do not take more interest in putting it away and holding it so you can realize several hundred per cent. more for it by keeping it a few months longer.

I extend an invitation to you, if any of you come to Philadelphia, to come to the Reading Terminal Cold Storage Plant and I will gladly show you the method by which we successfully keep fruit, and dispose of it, and I will be glad to give you any other information on the subject and do anything I can to help you make money.

I thank you for your kind attention.

CO-OPERATIVE MARKETING OF FRUITS AND EXPORT TRADE POSSIBILITIES.

By A. W. FULTON, Managing Editor, *American Agriculturist*, New York City.

Mr. President, Ladies and Gentlemen: It has been well said that the business end of fruit growing is in the market, and I would be very foolish if I thought I could give any advice to these practical fruit growers who have met here to-day, but I have taken a great deal of pains to ascertain the various questions which arise concerning the marketing of fruit. I will try to confine myself closely to the figures, and try to avoid going outside of the subject. With that end in view, I have written my thoughts down in a paper.

I need not tell you that fresh fruit is handled in two ways, individually and on the co-operative system. These two general plans comprehend most of the distribution, no matter in what part of the country the fruit is grown, nor how it eventually reaches the consumer. Within the limits of this brief paper I shall touch but lightly upon the individual sale of the grower's crop of apples or berries, as in this conditions vary as far as the east is from the west. Instead, I propose to rapidly bring before you what is actually being done by a number of successful associations marketing fruit on the co-operative plan. Then finally a few words on the export possibilities in certain of our splendid fruits.

Your association represents the highly important fruit interests of the great State of Pennsylvania, and I want to say right here that the possibilities of commercial orcharding in these hills and valleys has been by no means measured. For many years I have given close and personal attention to the wholesale fruit markets in the eastern cities, and have from time to time been confronted with a statement made by some commission merchant or wholesale dealer, that Pennsylvania does not cut so much of a figure in the big apple markets as one might expect; far less, for example, than

western New York or Michigan or possibly Missouri. When asking why, the reply is given me that Pennsylvania grows enormous quantities of apples, but not in the systematic manner in vogue in the territory adjacent to Niagara Falls, or some of the southern counties of Michigan, or in the Southwest. There, an operator may go into an orchard before harvest, and buy an entire block of 10, 20 or 40 acres of Baldwin apples, or Greenings, or Spys; or if in the southwest, the much berated leather-skinned Ben Davis. But if this same operator with apple storage facilities comes into Pennsylvania, it is difficult for him to find an orchard of a given variety of standard sort, running clean, even in size, and free from blemish. Were he to buy an orchard he would be obliged to take apples of a dozen or twenty varieties and this means lack of the uniformity which the large operator seeks. But I am constrained to believe that with the impression being made upon our Pennsylvania fruit growers in recent years by just such organizations as this, together with the excellent work by the experiment station and other educational enterprises, permanent good is being done toward placing Pennsylvania, with its large aggregate output of apples, mentioning that fruit for the moment, nearer the front rank in commercial orcharding.

Last year I had occasion to make very thorough research in all parts of the country into the subject of co-operative marketing of fruits. Among the interesting things I learned was that this valuable avenue of distribution is only in the beginning of its usefulness. Here and there highly successful fruit marketing associations are conducted. In other places the work is in a formative stage, while very largely this phase of the business is still something entirely of the future. Through my investigations at that time, and through the most recent confirmation of conditions, I am inclined to believe that co-operative marketing is more observed (and perhaps more successful) in small fruits, particularly strawberries and grapes than in tree fruits. I am not now alluding to the great co-operative associations on the Pacific Coast, which are in a way a class by themselves. In the western apple producing sections east of the Rocky Mountains, the movement for co-operative marketing is in somewhat the same condition as here in the east; some fairly successful organizations, but as a rule, apples handled independently.

In apple orcharding there are many things in favor of inducing buyers to personally visit the orchard at time of harvest or just before in order to secure the best prices, this fruit being of less perishable nature than berries, for example. In fact, both West and East, there is a very strong drift among successful orchardists, to sell their apples on the tree, or barreled, as the case may be, at home rather than through consignee or a commission merchant, to say nothing of any attempt to handle the apples on the co-operative plan. A highly successful apple grower in Illinois once gave me this testimonial expressed in a single paragraph: "I have tried to find out how to get the best market results; I have consigned apples to various commission houses and this method cost me thousands of dollars owing to unsatisfactory returns. I have sold apples to be paid for on arrival, and this is as bad, as the commission house is liable to turn down the car of fruit on arrival, provided the mar-

ket is a little off, and wire that the car has arrived out of condition and subject to my order. The rejected car is then turned over to some other house which, of course, has a good excuse for slaughtering this rejected fruit, and then I may be called upon to pay freight and other incidental expenses. I consider the most satisfactory way for the producer is to sell his apples at home, either in bulk in orchard or by the barrel, packed and settled for on the spot."

It does not necessarily follow that this successful orchardist's experience is the best for all to observe; conditions may vary as to location. But right here comes in the absolute necessity of fruit growers keeping posted on crop prospects, as the season moves on from month to month; and on market conditions in order that they may sell the fruit independently at the right time, and get for it all the market will stand. Growers who are not in favor of consigning apples claim that the man who does consign is practically obliged to "hold the bag" all the time. He takes all the risk and worry and also stands the cost of growing, picking and shipping, with the result that if anybody gets hurt in the deal it is in this instance the producer. In a word I have been unable to find any positive evidence of abundant success in the co-operative sale of apples, although in the Southwest there are developments along this line. Pears and quinces may be properly placed in this same class, while peaches and cherries should be regarded in much the same light as quickly perishable fruits along with berries.

Bearing upon this whole subject of marketing fruits, it is worth while to note that in some of the New England states commercial apple growers are becoming greatly interested in the Canadian Fruit Market Act. This is, no doubt, familiar to some of you. In brief, it is a stringent law regulating what shall and what shall not go into a barrel bearing a certain brand. In a sense, it is the legislature coming into the deal, and forcing the orchardist to be honest in packing, grading and marketing his apples. The theory is that it will eventually prove for the greatest good of the greatest number, producers included; that action which tends to place on the consuming markets fruit in better condition will tend to greatly increase its use and must benefit both consumer and producer.

The Canadian law provides substantially for two grades of apples, No. 1 and No. 2. Amendments which went into effect last July placed Canadian No. 1 grade somewhat higher than formerly, and really means that every apple in a No. 1 package must be practically perfect. A 10 per cent. allowance is presumed to cover only such defects as could not readily be detected by a fairly careful packer. The standard market grade in Canada under this law is in reality the No. 2. Such package will contain apples 80 per cent. of which are free from any defects that will cause material waste. The No. 3 is not defined by the law, but is provided for the purpose of meeting the needs of any marketable apples that may not qualify for the higher grades. Each box or number intended for sale must be plainly labelled in conformity to the law before fruit is taken from the premises where packed. There must be the full name and address of the individual or corporation, name of the variety, and a distinction of the grade, and no one must sell fruit or offer it for sale unless the package is thus properly marked. Violators of

the law are subject to sharp fines and imprisonment and inspectors have close oversight in the enforcement of the law.

Commercial orchardists in Western New York, competing with Ontario growers in the export markets, are watching with the keenest interest the working out of this Canadian Fruit Marks Act. At last winter's meeting of the Massachusetts Fruit Growers Association a strong appeal was made by a representative of the Maine Pomological Society, asking that apple interests in the two states seek to promote state legislation closely akin to the Canadian law, but it is worth passing note that at the Maine meeting the past fall the thought was there expressed that it is a little early to force such legislation, even though it may be ultimately a wise move.

As to the standard apple package, I have been told both at home, and when personally visiting the London and Liverpool markets, that dealers, except in a restricted way, do not want anything but the barrel in handling this fruit. Foreign buyers of American and Canadian apples as well as those in the domestic trade are all a unit in expressing the hope that growers will each season improve in the matter of picking and packing. As a rule, they want a barrel of regulation size, the flour barrel or its equivalent. This, of course, holds rather less than the three bushel barrel advocated in a few sections. One of the best posted men identified with the International Apple Shippers Association made this statement to me, that apples packed in a good flour barrel will bring as much money in any market in the world as if in an absolutely new barrel. But in these days of advancing prices, it is sometimes a toss-up in the matter of cost between a good second-hand barrel and one just made from new stock.

Some of the most notable successes are in the co-operative marketing of small fruits and vegetables; and the organization, local in character and capable of adaptation in some form by Pennsylvania growers, forms an object lesson worth our attention. For example, a successful association of this character has long done business, with Cobden, Ill., its center of operations in fruits and truck. This is a regularly incorporated shipping association; the manager makes it his business to make contracts with the transportation companies, and to secure the number and kind of cars required by shippers and at the time required. In cold weather, for shipping sweet potatoes, the cars required in the daily supply are placed on side tracks ready to receive the barrels. In summer, when iced cars are needed for shipping such perishable stuff as strawberries, the manager procures the cars, and has them properly supplied with ice ready for immediate use. He collects information daily about the markets and prices, receives fruit at the cars, receipting to the owner for the same, sees to it that the fruit is placed properly in the car, makes a manifest for each owner, and bills the car to the proper person at its destination. In this way the best rates and services are secured. The cars are shipped from one person in the producing section to one person in the distributing market, and takes away entirely from the railroad the important work of loading and unloading. During the fruit season, 15 to 20 cars are shipped daily from Cobden, representing, of course, many thousands of packages

and securing to the individual grower a degree of uniformity in handling, which in the long run, proves profitable to him.

One of the largest co-operative enterprises of this character in the United States is the Ozark Fruit Growers' Association, with head office at Fayetteville, Ark. The management has placed the stock at \$1 shares in the hands of as many growers as possible, this creating a nucleus for working capital. In this territory, comprising chiefly the two Arkansas counties of Washington and Benton, fruit interests are very important, not only apples but peaches, strawberries, etc. Through the efforts of the association some reduction was secured in refrigeration charges, and more prompt railway service was also secured. Shipments have been heavy in several seasons, and the association has proved a profitable thing for the growers. At the height of the shipping season representatives were sent to the larger markets to keep oversight and report on cars of fruit shipped. The outlay for so large an organization is necessarily heavy, this including traveling expenses, office force, telegraphing, postage, etc. All these expenses are met by a three per cent. rebate from consignments, and no assessments on members are needed. This association, operating in such an exclusively fruit section, can scarcely be compared with what may be done in a smaller way in our more scattered fruit sections, yet it is inspiring to know that the organization named has been the means of saving its members, the actual growers, substantial sums which formerly have gone into the hands of the middlemen.

A successful co-operative association, now just two years old, is the Wathena Fruit Growers' Association of Kansas, starting with 12 members, now having a hundred. During the past season this association marketed \$12,000 worth of strawberries, \$35,000 worth of raspberries and blackberries, 56 cars of apples, and a sprinkling of peaches, at a reasonable profit to the producers. Grapes, peaches and apples were sold in carlots, with shipments east and west, and the small fruits mostly shipped by express, to various states. The officers of this live association are all fruit growers, operating their own farms. The business manager writes me under recent date: "Our association has been very beneficial not only to the members, but also to fruit growers of this vicinity, as we have succeeded in maintaining a much better average of prices than in former years. We also buy our crates, material, baskets and barrels in lots of eight to ten carloads, and pay cash for same, averaging splendid savings to the growers. We permit all responsible houses to compete for the business, and by so doing save a good deal of money on our supplies."

One of the really successful organizations for the co-operative sale of small fruits is the Neosho Fruit Growers and Shippers' Association operating from Neosho, Mo., which is quite a center, particularly for strawberries. This truly local association, something which might be readily duplicated in many localities here in our eastern fruit sections, has carried on its business long enough to have passed the experimental stage, and is favorably known in other states outside the confines of Missouri. The farmers making up the association grow some cane fruits, and have also shipped some plums, cherries, peaches and apples, but confines its business mostly to strawberries.

In a word, this association is essentially for growing and shipping strawberries on an extensive scale. There are 140 members in the association, and they grow a total of 800 acres of strawberries. Last season they shipped 70 carloads, the year before 105. Frost reduced the last crop materially as here indicated. Shipments are made from Neosho to Kansas City, St. Joseph, Topeka, as far west as Denver, as far north as St. Paul, and as far east as Detroit. The association consigns to reliable and responsible commission merchants in these various cities. The fruit is never sold on track. In a recent letter from President J. B. Graves of this association he informs me that with the kind of berries his association grows, and with the excellent care taken in packing, he finds better results with commission merchants than with track buyers.

Now very briefly as to the by-laws of this association. The membership fee is \$1, annual dues \$1, and when growers in the association ship berries as a firm or company, each individual member of the firm must become a member of the association. The usual officers are elected annually in August, president, vice-president, recording secretary, treasurer, also chaplain, and a business committee consisting of five members. The secretary keeps all records, collects all moneys due the association for dues, fees, fines and forfeitures, turns this over to the treasurer monthly, taking the latter's receipt therefor, thus constituting a bookkeeping account for the work of the auditor. The secretary is under bonds of \$400, and the bond is kept by the president. The secretary receives \$25 per year for his services. The treasurer is under bonds of \$1,000, and he also receives \$25 annually for his services. He handles the money of the association, paying out on proper warrants which are to be signed by the president and secretary.

So much for the ordinary bookkeeping of the association. Now for the most important part of this management, which rests in the business committee, which it will be recalled consists of five selected members of the association. After election these organize, naming one of their number chairman. This committee is practically responsible for the success or failure of the years business as an association. Each member receives \$2 for each meeting which he attends. This business committee elects one of its number as secretary and treasurer of the business committee, and this man is really business manager and corresponding secretary. Naturally, the best man in the association is none too good for this. He is to keep a full record of all transactions of the committee, and attend to all the correspondence of the association. He receives all cash returns and rebates from commission merchants, and from other sources, and makes disposition of same as directed by the rules of the association.

The manager and his assistant are in full control of the loading sheds. The business committee pays all the expenses of the association such as just indicated out of the rebates in commission charges, etc., and 25 per cent. of the remainder they also pay to the treasurer of the association to hold. They also pay over to each grower his proportionate part of the returns after the cost of handling is deducted. The business committee each season selects the commission merchants who are to handle the berries of the association. A most important proviso is that every member of the association

obligates himself to turn over all the berries to the business committee to be shipped by them except those he may need for home requirements. In no case can a member sell berries for shipment unless he first obtains consent of the business committee. Infraction of this stern rule is dismissal from the association. Stress is laid upon the great importance that the growers deliver all fruit to the management, so that commission houses arranged with may not be disappointed by reason of failing to get accepted consignments. Each grower must be ready to deliver at the shipping sheds all berries he has to ship, each day, not later than 10 o'clock P. M. There are two grades of strawberries designated—A and B. The A must be strictly choice, firm, sound stock of good size. The B grade must also be firm and sound, but may be somewhat smaller. Fruit too soft for this grade will be rejected. After inspection at shipping sheds berries that grade A have the grades stamped on both ends of package with the association's trade mark.

It will be recalled that all the berries going to Kansas City, for example, are shipped to a selected commission concern handling the business. Each grower having fruit in that shipment shall receive an average price per crate of each grade each day. When it is necessary to hold berries over from one day to the next in the city market, the average of the two days is the rule. In receiving the fruit at the loading shed the grower is given a receipt showing how many crates he had on that particular load, how many A and how many B. The fruit is perhaps sent to several markets the same day, according to market conditions, as understood by the manager. As just noted the grower receives for each grade the average of the sales for that day. It is known how many grades were shipped each day, and thus is known almost immediately what the fruit netted the growers. Settlement is made on the basis of the average.

All growers delegate themselves to be governed by the decision of the association in regard to prices to be paid for picking berries, and they agree that they will not pay more than the fixed rate. If they do they are thrown out of the association. The business committee makes arrangements with the railroads for cars and for securing the lowest possible rates, for the refrigerators, with the express company for service and rates, and for other necessary service. They make arrangements with commission merchants before the shipping season opens and know definitely who will handle the product. In investigating the city commission merchant, they find out not only that he is honest, but also that he is capable and active. Then they stick to him as long as he does the right thing by the association. The business committee buys the box and package material for distribution to the growers at cost, getting it early at reduced rates in carloads. They supply stamping outfits, tally sheets, rules for pickers and packers, etc., and appoint inspectors for cultural work in the field, and for packing and grading. Full advantage is taken of any possible competition between transportation companies. Very little is sent by express as charges are too high. Instead refrigerator freight service is used.

A point about this successful co-operative association is that they stick together, that they have strict rules, that they enforce them, that they buy together at lowest cost, that they sell well-grown, well selected and well packed fruit at highest prices, and at lowest

cost in the way of transportation charges and commissions. It is the application of business principles in growing and marketing strawberries with exactly the same features brought to bear that may be discerned in the manufacture and sale of shoes. Last season one grower in that association sold \$1,000 worth of berries from three acres. Another picked 210 crates per acre from his plantation of three acres, which sold at an average of \$1.73 per crate.

Coming nearer home, let us note briefly what is being done in the middle south. The Peninsula produce exchange of Maryland, with headquarters at Pocomoke City, was organized three seasons ago for the purpose of buying and selling and handling produce. It is, in fact, a producers' agency for marketing potatoes, peaches, berries and melons. It has the usual complement of officers, general manager, etc. Much emphasis is placed on having the goods well packed and true to classification as to grade and quality. Each shipper is charged 5 per cent. for all goods sold outright at shipping station, and 8 per cent. when shipped on consignment to the commission merchant representing the exchange. The latter guarantees the payment of all goods consigned or sold. The treasurer makes draft for some through the main office. The work of the exchange is satisfactory to its members as a whole. Shipments of sweet potatoes have greatly increased in recent years. The grading is being improved and the exchange insists on sending out packages of standard size and a grading that meets the approbation of buyers and consumers. A large part of the goods are eventually handled by commission merchants in the big cities, yet it may be noted that the exchange seems to favor selling F. O. B. shipping points at many of these stations.

In actual working a member of this peninsula produce exchange packs his melons, for example, according to the instructions, and on arrival at the shipping point delivers them to the exchange inspector, if business at that particular loading station justifies the employment of an inspector and also an agent. Otherwise, the melons are delivered to the representative of the exchange who acts in both capacities. The goods are then properly branded and loaded in cars, if shipments are sufficiently large, and sold at once, at an agreed price, F. O. B., loading point, or consigned as the agent thinks best. For this service the exchange proper receives 5 per cent. which goes to defray the running expenses of the association, the surplus being eventually paid back to the stockholders at the end of each season. The growers and shippers constitute the stockholders. The general office has telephone connections with the several shipping points and is in touch with its representatives at any time of the day. If a shipper requests that his goods be sent to New York or Boston on consignment, this course is followed. In most instances, however, the grower prefers to turn the goods over to the exchange to be handled to the best possible advantage.

Another success of this character is the Eastern Shore of Virginia Produce Exchange, operating in the counties of Northampton and Accomac on the Chesapeake Peninsula.

This has been in successful operation for six years or more, and at its last annual meeting held in December, it was stated that during the season of 1906 the exchange handled 1,083,000 packages of truck, mostly white and sweet potatoes. The volume of business

passing through the office amounted to \$1,411,000. A successful year was reported and a handsome dividend declared on the share capital. This co-operative company operates at forty shipping points, ships all under registered trade mark and the business is handled in a thoroughly up-to-date manner. A general manager is the responsible agent for the buying and shipping. He advises local agents to whom they are to consign their produce. He sends them every morning or oftener, if necessary, to the various market quotations. He must also see that the goods are properly inspected, and keep a careful record of the number of packages shipped daily. City commission merchants who are in arrears for 20 days in the settlement of accounts receive no further shipments until the settlement is made in a satisfactory manner. The general manager visits the local shipping points once a month or oftener. In the local exchange the appointed officers are responsible for the storage in packing houses, and make daily reports to the general manager. Where the produce is consigned by the exchange, the local agent mails to the consignee an invoice of number of barrels or packages, together with the names of persons who have furnished it, and the number of packages each person has in the consignment. The consignee makes separate cash returns to each person, first deducting 5 per cent. This is sent to the treasurer of the exchange, with a full statement as to the source from which it comes. This accumulating fund is, of course, handled eventually as the stockholders desire, either in the way of improving the equipment after expenses are paid or in dividends, etc. The local exchanges have proper representation on the board of directors of the exchange. Great care is taken in packing and shipping, with special trade marks which stand for something, on selected lots. This farmers' organization handles in a season 3,000 to 4,000 cars of sweet and white potatoes. In 1905 and 1906 it cost less than 5 cents a package in association expenses to handle the crop.

Growers of cauliflower in an important trucking section on Long Island formed an organization several years ago for marketing their crops, and have succeeded reasonably well. Last season was excessively wet during July and August, and the crop was badly damaged, cutting down the business temporarily. Yet during the shipping season, nearly 66,000 packages were handled, and to the general satisfaction of shippers and receivers. In a good season as high as 130,000 barrels of cauliflower are handled by this association, mostly on the New York market. The managers closely watch conditions, and the moment the New York and Philadelphia market is over supplied, the surplus is promptly shipped to other cities. Cauliflower shipped to points outside those named were bought outright from the farmers by the association, and distributed as far west as Chicago. The association now has 400 members, and pays its manager \$1,000 a year salary. Great savings are effected in the purchase of supplies and the utilization of refrigerator cars, etc.

Reverting for the moment to the possibility of enlarging the market outlet for apples, I want to call your attention to what is really an encouraging phase of commercial orcharding. I refer to the business of evaporating apples. As all of you know, this has in recent years grown to a large industry, centered perhaps in a few counties in Western New York, but also of considerable prominence

in Michigan and the Southwest. Within the past few days I have taken pains to further investigate the situation, with a view of throwing some light on the probabilities of profitably increasing the output of evaporated apples. Inquiry made among some of the most prominent dealers in the New York City Market bring out the highly encouraging opinion that the business is not overdone, and that within reasonable limitations it may be increased considerably, and still leave a margin of profit to all engaged in it.

This is apparently to come through the further building up of the export trade. Evaporated apples are very popular in the domestic markets, and the consumption is large, yet certain facts bear directly on this business in the way of limiting the quantity which producers can reasonably expect to market at home. Reference is made, for example, to the development of cold storage throughout the country, so that ripe barreled fruit is much better distributed and taken care of than formerly. Furthermore, the domestic demand is perhaps not increasing so rapidly as might be wished, for the reason that fine California dried fruits, prunes, peaches, apricots, etc., are very largely used as a substitute.

But the wider outlet is to come from the foreign demand. We export in some years as much as 50,000,000 pounds of dried apples, mostly evaporated. The opinion of those closely identified with the trade almost without exception points to the possibility of further extending the business in foreign countries, particularly northern Europe where evaporated apples are very popular. It depends very largely upon the price of the finished product. If foreigners can buy evaporated apples at 5 1-2 to 6 1-2 cents per pound in a wholesale way, they are prepared to take large quantities, but when the figures go to 7 cents and above, the movement is more restricted. Ocean freights are low and favorable, and our fruit is very popular abroad. The business is thoroughly established as to curing, grading, packing and shipping, and with the friendly attitude of both exporters and foreign buyers there is every assurance that the outlet will be permanently large, and is capable of further material expansion.

Now for the practical application to the Pennsylvania fruit grower. It would be ill advised for the orchardist without adequate knowledge or equipment to go into this business of evaporating apples; but it is well worth careful consideration as a means of disposing of at least a part of the surplus crop, particularly in full years. An evaporating plant is not expensive, comparatively speaking; there are possibilities of co-operative work in thus handling the fruit, or small stock companies might be formed to establish and operate a plant, with, of course, the prerequisite that this is well managed from its inception. There would also seem to be room for the individual grower under proper environment, as has been proved in many instances in Western New York. When apples are scarce, many of the larger evaporators cannot get raw material at prices to justify operating them, and this leaves the business to some extent in the hands of individual farmers and fruit growers, who thus utilize from their own supplies considerable quantities of low grade fruit. Evaporated stock outsells the sun dried a cent or two a pound, in average seasons, and in some years more. One argument which has been advanced why general good would come from a far wider extension of small evaporators is the way in which this might

hold speculators in check. As it is now, there is much manipulation, engineered by some of the larger concerns identified with evaporating plants and the few firms engaged in the export trade. The opinion has been expressed that if the number of small evaporators is materially increased, this very fact will tend to take control of the business from a few hands, and put it into many, thus helping the industry in a large way.

An evaporator with a capacity of 100 bushels of apples a day costs somewhat less than \$1,000, and should turn off 500 to 600 pounds evaporated apples from 100 bushels of green stock, together with 200 pounds of skins and cores.

The federal pure food law which has just gone into effect is puzzling dealers somewhat, owing to the fact that evaporated apples are treated with sulphur fumes in order to bleach them, and there is much interest over the question of ruling which may be made; yet no doubt the matter will be amicably adjusted. The business in evaporated apples, in a word, is not overdone, nor does it seem probable it will be in the immediate years to come, and wisely handled ought to be the means of disposing of an increasing proportion of our annual apple supply.

No business will run itself, a co-operative fruit selling organization any more than a woolen mill or a trunk line railroad. Many co-operative enterprises, at one time prosperous and full of continued promise, have fallen by the wayside through bad management. This may include lack of a strong man at the head of the business in distributing and selling products, and lack of a thorough understanding of market conditions in the big trade centers, and sometimes a lack of firmness in maintaining a high standard of excellence in quality of fruit and in packing. Long credits proved, among other things, the death of one very successful co-operative fruit shipping association located in New Jersey. Summing up the situation, the problem before every fruit grower, as each season rolls around, is to sell his produce in the most advantageous manner, either single handed or co-operative.

Some of the thoughts outlined in this paper may be summarized, with deductions therefrom, embodied in a couple of concluding paragraphs.

If a number of growers in one town would work together in some such way, as the thoughts in this paper suggest, they might combine in shipping, and thus give co-operative marketing a practical test right here in Pennsylvania. Study thoroughly the co-operative movement as it has been developed, and reasonably perfected in other sections. See what can be done, or what application can be made of these various successes to conditions in your own locality.

A great essential right here is a thorough knowledge on the part of producers of market conditions; not only at your own town and shipping station, but in the big distributing centers at home and abroad, something of the export trade, something of domestic requirements in various cities, something of the temper of dealers who buy in the autumn for later markets, etc. One thing necessary is to know the market to which you ship, when, and how to ship. One large commercial center will take with avidity certain apples or certain peaches which would meet slow sale in another big dis-

tributing center. Certain varieties of apples are quick sellers in Philadelphia, but would meet indifferent reception in New York.

Special emphasis should be placed on the grading, packing and handling of your fruit. Appearance often sells it. Mark a No. 1 apple No. 1, with your name, and make it stand for something. If you must barrel inferior fruit, have the courage to pack No. 2s as 2s, and so brand them. Remember in this connection that it costs just as much for the empty barrel; it costs just as much to pack and ship seconds as first. You will not make a fortune the first year, nor probably in the second. But persistence in some such course will eventually count for much, to your permanent profit, whether you sell independently, or co-operatively; whether you cater to the local wants of your home county seat, or a distant mining or manufacturing center, or whether you plan to place your fruit in the large city markets.

THE PRESIDENT.—I am very sorry we have had so small an audience to hear this valuable paper. The marketing of fruits is one of the weak points.

MR. YOUNGS.—Over on the shores of Lake Erie we have a co-operative fruit growers association; that is, a co-operative crop growers association. It is a large undertaking, but the great belt of crop growers belong to that association. Of course, there are some houses there who maintain agents all through the season. There are from seven to ten thousand carloads of crops shipped in our town.

MR. HALE.—I have been very much interested in this paper, and believe in the co-operative associations among the growers of anything in the soil, for I have worked with them for the last thirty years. The gentleman in this most excellent paper covers a few of the western associations, and shows that they have been most successful. There is one instance that I know of where they gave the secretary twenty-five dollars a year. Farmers are never willing to pay like other commercial people, who are willing to pay for services—for their help. Every co-operative association we have had in this country, has tried to run it so cheap that it has run itself into the ground in a very short time, I am told. I don't want to reflect any upon anyone, or to name anyone tonight, but I have been in contact with some of the commission men, the first class men, who tell me that they get very little from the association because you have to graft some of its officers. That information I have had in the last two years from some of the best commission men, that you cannot get the fruit from them because you have to graft the officers. I hope the reporter will not put that down because it will hit some one. So much for that in a general way. But it don't work out somehow with the man owning only a bit of land; he does not want to co-operate with anyone.

The suggestion brought out by the paper in relation to the Canadian fruit market, and our friends in Maine waiting and going to consider it in another year, when legislation is obtained, comes to my mind. Mr. President, and brother fruit growers, ought we not to be ashamed that we don't know how to do it without having legis-

lation; to show us how to pack our products and crate them? What would the manufacturers in New England think of that? Meet together and talk about the government under which they live to specify how they should crate and pack their products. It is a reflection on our business methods, and good horse sense, should tell us we must pack them honestly and pack them right, if we are going to make them pay. I hope every good man will put his foot down on the man who talks about legislation to tell us how we are going to crate our products. Brother Brown, said those apples must be "Axx." Make your number ones perfect, and if you have anything below that, call them seconds and thirds. Perhaps I am talking heresy here, and perhaps it is not the place to talk it. I will tell you a little story along that line. Down south the colored people want to attend churches; the churches are plain and simple, but a colored woman coming to one of our northern churches, and noticing the stained glass after she entered the church, expressed her gratification by saying, "Lawd to Gawd; Lawd to Gawd, I'm glad I'm in this church," and one of the of the ushers went to her and said, "You must be quiet." Pretty soon the organ broke out in peals of splendid music, and she said, "Glory to Gawd, I'se glad I'm here; I'se glad I got religion," and the usher came again, and said, "You must get out of this; this church is no place to get religion." I want to get the religion of honest packages and stamp on them our own name and reputation, by putting on our labels and crates our own names, and impress the market in that way.

Now another subject which was of great interest to me was the remarks made by the gentleman from the Reading Terminal. I have heard for a good many years that Brother McKay, was one of the best cold storage men in America, and that he tried to make a success of it. He tried to fool us in the statement, when he got on the platform, when he said he was not a speechmaker, and for awhile I was going to go along with him, but by and by he went along in that smooth way and I found I was mistaken, and I want to say right here that is the slickest way to get at it, and he got there. Of course, he was not near as slick a talker as Brother Brown. Why did Brother McKay get there? He is really an old philosopher. In talking he had the sound philosophy of it; the sound philosophy of the handling of the products of the market. He said that as soon as you took your fruit in there, he knocked a head in the barrel because he wanted to know what you are putting in there, and because it will bring better prices if it is honestly packed with care. He said, if you don't know anything about your goods, send them in there, and I will store them, and if they don't sell out and make a profit, I will not charge you anything. The man who has no faith in his soil, and his plants, or in his business, cannot succeed, and the man who wants to have the government tell him how to do business had better get out of business.

I think now that it is pretty near good night. I have talked more than I ought to, but I am glad to be with you. I was told a few years ago that when I would come to Pennsylvania to attend the association meetings, I would find a few old sod pots who patted themselves on the back, but I found a good many good men in it, and that my informant was very much mistaken, and I am glad to find so many young men in it. I know these young men will have greater

opportunities on the farm than there is any other industry. Stick to your farm, and you will have the best kind of fun in it. The next time you come here bring your best girl and bring the other fellows's girl along, and we will have a rousing old meeting; a much better meeting than this time.

MR. YOUNGS.—Our association pays the man at the head of the co-operative association twelve hundred dollars, and his assistant, five hundred dollars, for six months, and pays stenographers. We don't expect something for nothing, because we know we won't get it.

MR. BROWN.—The failure of one Fruit Exchange in Delaware, was because they would not submit to an inspection of their fruit; that was the cause of the Delaware Fruit Exchange starting. I was the second Secretary there when the first one went into operation. The success of the Potato Exchange in Virginia is the outgrowth, but what he says is very true in interfering with their success, because you have no more power over your products than that chair has, and it is for that reason they have made a greater success of the Potato Exchange of Virginia than any exchange in America.

Mr. Jamison, of Committee on Nomenclature and Exhibits, submitted the following report.

Mr. President and Members of The State Horticultural Association of Pennsylvania: Your committee begs leave to report as follows after as careful an inspection as could be made during the intervals between sessions, there being some 250 plates on exhibition.

Best selection of Pennsylvania apples. The Fruit Growers Association of Adams county, about 100 plates.

Diploma for best display of Pears, thirteen plates, Gabriel Hiester, Harrisburg.

We also award diploma to Hon. W. T. Creasy, Catawissa, for fine display of apples, ten varieties.

A diploma is also awarded to L. M. Simon, Linglestown, Pa., for fine display of ten varieties of apples.

We further agree to award to J. Hibberd Bartram, West Chester, a diploma for one plate of exceedingly fine Seckel pears.

We would state further that the seeding pear grown and exhibited by John Kready, Mount Joy, Pa., is of fine quality and worthy of further cultivation. Also a jar of canned pears of same variety, represented by Mr. Kready to be a fine winter pear.

We wish to make favorable mention of the exhibit of one of the finest displays of apples. Among them are, York Imperial, Nickajack, Nero and Staymen Winesap, grown by R. M. Richardson, Wyoming, Delaware. Winesap apples and Bartlett pears by John Repp, of Glassboro, N. J., one plate of Keiffer pears by J. H. Harrison, Berlin, Md., all exhibited by Geo. H. McKay, Philadelphia.

Also several plates exhibited by Wm. Stewart.

Mr. A. O. Braugher, Kingston, Pa., fifteen plates.

Adam Berk, Kempton, Pa., seven plates.

Mr. Jeremiah Bean, of Winfield, Pa., two plates.

J. R. Snavelly, Harrisburg, seven plates.

Dr. Funk, Boyertown, Pa., exhibits seven plates.

Dr. I. H. Mayer, Willow street, Pa., three plates namely, Strinetown Pippin, Champion and Winesap.

Also an exhibit of seven plates by E. H. Bancroft & Son, Wyoming, Del., among them being Stark, Tulpehocken, William's Red, Strawberry, Missouri Pippin, Highfield, Fall Pippin, York Imperial Stayman Winesap, Beach, Nero and Paragon.

Mr. J. W. Sander, five plates.

Mr. Wm. H. Rumble, Ringtown, Pa., exhibits five plates fine apples worthy of merit.

Also one plate English Walnut grown by John G. Rush, West Willow, Pa.

We would further say that the entire collection is one of the finest if not the finest ever exhibited.

All of which is respectfully submitted.

J. E. JAMISON,
J. HIBBERD BARTRAM,
A. I. WEIDNER,
JOHN G. ENGLE,

Committee.

Resolutions commending the work of Prof. Surface, Economic Zoologist, and recommending his re-appointment, were offered by Mr. Woods, of Stroudsburg.

MR. YOUNGS.—Over there in our corner of the State we know something of the work that Prof. Surface has done, and we know that he has done it well, and while it is not completely done, I don't think it is well to swap horses while crossing the stream. For that reason, I think the horticultural interests would be best subserved by having him retained in the department which he now represents.

MR. JAMISON.—I have been in this association for a good many years, and we have had at the head of this department a man who has been in close touch with all that benefits the farmer or horticulturist. I think we never had a man that deserves as much as Prof. Surface. In all his travels he was always talking to his constituents of Pennsylvania, and I say he has done more good work in that line than an other man we have ever had, and therefore I recommend that we send up from this association a unanimous vote.

The resolution was unanimously adopted by a rising vote.

THE PRESIDENT.—If there is no other business, a motion to adjourn will be in order.

MR. BARTON.—When they were speaking of cold storage it reminded me of an experience I had a few years ago. I had some thirty or forty bushels of pears in a storage plant of my own. I had them in boxes, and put them in very close, and put one box on top of the other for fear that mice would get in, and I watched them and kept examining them. I had the temperature down to about 37 degrees, and one market day I thought the pears were in marketable condition, and taking down the first box, found they were in a very nice condition, and every other box, I threw out to the hogs. The difficulty was that they were put in, in too warm a condition; they were not cooled off, and the boxes fit very closely and tight, and I lost the whole crop of them.

MR. WOOD.—I suppose the winding up of this meeting will be a kind of experience meeting. I have not been a member very long,

but I have come quite a distance to attend this meeting, and coming here, and hearing such men as Brother Hale, Brother Brown and Brother Surface made me feel something like the colored woman that Brother Hale told us about, and I hope my shouting will not result in being shuffled out of this room as they did the colored woman. I feel that I have got more horticultural information than I had before.

MR. BROWN.—I want to express my gratitude in being here. I have noticed the growth of horticultural interests in Pennsylvania, not only in numbers, but in the character and strength of the men that compose it, and it is something very pleasing. You are banded together now in this fraternity, and are going to go forward and do those things that are necessary to be done from year to year that is going to advance this industry. I am very glad to be here tonight to meet all the old faces and many new ones. I hope we will all have the pleasure to meet in Lancaster one year hence.

MR. YOUNGS.—Allow me the pleasure of extending an invitation to you members of this society, individually, if they are ever over in the section of the State of Pennsylvania that I inhabit, to come and see us. We can show you some things over there that we are inclined to be proud of. Brother Engle is an annual visitor over there, and I think he will agree with me. My address is North East, and if you cannot run across me down town—I am often there—you can reach me by post, or by trolley, and I will be glad to meet you at the trolley line. We can show you some very fine grapes, peaches and plums, and while our work is not so satisfactory to everyone, yet it has been to us, because it brings us dollars. I think we all have horticulture in our hearts, but we are all looking after that Almighty dollar.

MR. JAMISON.—I am not a Methodist, but since the thing is going on, I am getting warmed up, and I wish to say that I attended the first horticultural meeting, which I was persuaded to do through the Secretary's father. I got my early horticultural education from him. I began to think about 1872, or along there, that we could grow peaches in Juniata county. I had a friend close to me, and we would often talk about it, and I am not so sure but that we talked about it on the Sabbath day. I planted a few trees, and we bought a few trees from Mr. Engle, and he said, "Come down to our meeting;" and when you come, I don't want you to go away from this meeting until you tell us how you are getting along up there. I told them how we took the hills of Juniata county and cleared them of briars and brush and made the peach bloom as the Lily of the Valley, and when we were through, there were one hundred thousand trees growing in the Juniata Valley, and the bankers in our county seat will tell you that for years one hundred thousand dollars were thrown annually into the banks. What brought it about? It was the work of this horticultural society. When I look around me here now, I see very few familiar faces who were members then. Here is brother Bartram; there is Brother Engle, and Brother Heister; there are not many others, and it will be a very short time until the rest will have to answer the last roll call.

MR. HEISS.—Mr. President, this is the first time I have had the pleasure to meet with you and look into your faces, but I can go back into the hills of Clearfield county and Centre county, and talk with the farmers with a new inspiration and as a helper in the work, and I trust I may long remember the new faces I have met here, and whether I ever meet you again, I want you to know that this meeting has done me as much good as any meeting I have ever attended.

MR. McKAY.—I am a Methodist too, and I believe in giving good advice. I don't believe in sitting here with no smile on your face, and take it all in, and not give anything back. I think the fruit growers are going to pull through allright. It reminds me of the story of a young man who had a mother-in-law who was very sick, and he went out and met the doctor, and he asked how his mother-in-law was, and he replied that she was pretty bad; I don't think we can pull her through, and he said, "Bring an axe, and I will help her through." I feel I am going to be a fruit grower, and that I have obtained a great deal of information by coming here, and hearing the old gentlemen talk on the subject of fruit growing, and it is also pleasant to look at the fruit that is here on exhibition, and I know it will be of great benefit to me in applying it to my business. There is nothing done in this world without discussion, and as Mr. Hale knows up in New Hampshire they will argue for days and days, and this discussion is what brings out the different points, and a great many of these fruit growers will get together, and talk about cold storage, and they will come to some understanding. As a Methodist, I say, God bless all of you.

MR. YOUNGS.—I came over here four years ago; we had some trouble over there; and said something about spraying. As a whole you might just as well have tried to talk about anything else, and I told you we cultivated a pretty hard soil at that time; at any rate, it looked so to me. I am one of those who like to come to a meeting of this character, and get something out of it, and I have not come this way for four years. You can get up a lot of enthusiasm here, and gather the farmers together, and although it is 366 miles to my place, I feel like coming again.

THE PRESIDENT.—I guess we have heard from all the converts and we are now ready for a motion to adjourn.

THE PRESIDENT.—As no one seems to be able to summon up nerve sufficient to move to adjourn, I declare this meeting adjourned until this day next year, when we shall meet in Lancaster, Pa.

LIST OF OFFICERS OF THE PENNSYLVANIA
STOCK BREEDERS' ASSOCIATION FOR YEAR
1907 AND PAPERS READ AND ADDRESSES DE-
LIVERED AT THE ANNUAL MEETING OF
SAID ASSOCIATION, HELD AT HARRISBURG,
PA., JANUARY 24 AND 25, 1907.

OFFICERS FOR 1907.

PRESIDENT.

W. C. NORTON, Waymart.

1ST. V. PRESIDENT.

DR. LEONARD PEARSON, Philadelphia.

2D. V. PRESIDENT.

M. P. SHOEMAKER, Greensburg.

SECRETARY.

E. S. BAYARD, East End, Pittsburg,

TREASURER.

J. F. LANTZ, Wyebrook.

PORK PRODUCTION IN THE EAST.

By HARRY HAYWARD.

That pork production is an important agricultural industry is shown by the fact that, while in the year 1900 the average private family ate a little over half a ton of meat, nearly half of which was pork. In other words, the total amount of pork consumed in the United States is nearly equal to the total consumption of beef, veal and mutton.

These facts are explained by another fact and that is pigs for various reasons are more profitable animals to raise than beef, steers, or sheep, and, on this account always have, and probably always will occupy a prominent place in American Agriculture. Of the reasons which tend to make pork production profitable, a few of the most important may be of interest. In the first place, pigs are

more prolific than any other class of farm animals; they mature more quickly, and can therefore be turned off sooner than any other live stock save poultry. Again, a pig produces its meat upon considerably less feed than any other meat-producing animal, much of which, moreover, could not be used advantageously in any other way. A pound of pork can be produced on half the amount of feed that is required to produce a pound of beef, and two-thirds as much as it requires to make a pound of mutton. Still another point in favor of the pig is, that the percentage of dressed weight is higher than in either beef or mutton. The average fat hog will dress off about 80 per cent. of his live weight.

There is probably no branch of Animal Husbandry which can be taken up with such a small outlay of capital as raising pigs. They can be kept in comparatively large numbers, in small enclosures or they will do very well on pasture which furnishes a part of their feed, and they are subject to but few diseases. As our population increases, the demand for pork on account of its palatability and nourishing qualities probably will also increase, and it is to discuss some of the questions that will arise in meeting this demand that this paper has been prepared.

According to the last census, Pennsylvania has a little over a million head of pigs, while states like Illinois, Louisiana, Indiana and Missouri have from three and one-half to ten millions. If these states that are so far from the markets find it profitable to produce pork, why can not the Pennsylvania farmer make it more profitable, since he can grow about every kind of crop that the farmer farther west can produce, and has one of the best markets in the United States at his very door?

With the prices of dressed pork hovering around the nine cent mark, I am strong in my belief that the farmers of this State can well afford carefully to consider the feasibility of making pig raising on a moderately large scale, one of their principal sources of revenue. I have had enough experience in handling a herd of from one hundred to two hundred and fifty head to believe that this is one of the ways easiest in which the eastern farmer can solve the labor problem; a very serious matter just now on most farms.

If a farmer is inclined to make pork production a large factor in his farm economy, he should make his plans carefully, and be sure of his ground in order to forestall subsequent losses and disappointments.

In view of the knowledge we now have, few would think of trying to grow pigs even on a moderate scale without the use of the pasturing system unless located near a city where garbage is available. This system calls for a very small area of tillable ground per head, which in course of time should become richer and more productive by the use of legumes and the droppings of the animals. Considerable thought should be spent in planning the layout of the yards and lots that the maximum amount of work may be done with the minimum amount of effort. The buildings should consist of a storehouse or granary in which could be stored at least a carload of feed such as bran, and a root cellar. Besides this, there should be half a dozen or more small farrowing pens that could be warmed in case of sows farrowing in very cold weather. These buildings could be arranged

in relation to the feed and pasture lots so that they could be easily reached with a car running on an overhead track. While such a plan will slightly increase the initial cost of a pig raising plant, it does away with the necessity of carrying the feed by hand, which is out of the question where as many as fifty hogs are kept; and not only does away with the expense of a horse and wagon, but the feed ways are not cut up in wet weather thus eliminating a disagreeable feature of most piggeries. With a little thought in arranging the overhead track most of the lifting, and much of the unpleasant sloppiness so prevalent around hog houses can be avoided. With an arrangement of this kind one good man will be able to feed and care for from three to four hundred pigs. In regard to pig houses, experience has demonstrated that the Lovejoy house, eight feet square, made of rough hemlock boards well battened, is very satisfactory in most climates. These houses will accommodate about eight two hundred and fifty pound hogs, will answer as farrowing pens in moderate weather, are cheap, and in case of an outbreak of disease can be thoroughly disinfected or even burned without much expense. Too much care cannot be given to the fences on a pig farm. As a breachy pig is as bad as any other farm animal that acquires the habit of breaking out. The best fence is of boards, but on account of the high price of lumber, such a fence cannot be considered, if one wishes to practice economy. The most practical pig fence perhaps is one of fairly heavy woven wire from 26 to 30 inches high, with a strand or two of barbed wire stretched above it.

If a fence of this kind is put up carefully so that it will be tight, the posts braced firmly, and the bottom of the fence stapled to stakes or small posts firmly set in the ground between the posts it will be pig proof and should last a long time.

From an economic point of view one will find upon studying the results of breed tests at a number of Experiment Stations that certain breeds do not produce pork uniformly so cheaply as do other breeds. On the other hand I do not think this difference great enough to offset ones own personal likes and dislikes in the matter of breeds. I think it true that as yet few, if any, of our markets distinguished enough in price between the so-called lard and bacon type of pigs to justify a preference for either type from a market standpoint. On account of the reasonable price for which pure-bred sow pigs can be bought, and as a pure-bred male is essential to success in any case, it seems reasonable to advise the use of pure-bred pigs rather than grades in general pork production. It costs no more to grow the pure-bred animal, and with but little care one may easily dispose of a pure-bred pig at two months of age for as much as he can get for a fat grade pig at eight or ten months of age. The more popular the breed selected the more easy will it be to make satisfactory sales of breeding stock. Go slowly on new or unfamiliar breeds. Few breeders are able to popularize new breeds so as to make many or good sales.

In feeding brood sows there are three points that should be constantly borne in mind: First, to supply the nutrients necessary for the proper nourishment of the sow, and the litter she is carrying, second, to make the ration bulky enough to keep the system open and in good condition, and third, to make it as cheap as possible.

During the growing season such a ration can be supplied at a minimum expense by feeding about two per cent. of the sow's weight of three parts corn and one part bran or middlings, tankage, soy beans or cow peas, the remainder of the ration being supplied by allowing the sow to run on clover, alfalfa or some other leguminous pastures. In winter cut clover or alfalfa hay mixed with the grain, together with a sugar beet or two of mangels will make a good substitute for the pasture. The sows as well as the boar should have abundant exercise, and in placing the houses in the lot where the pigs are confined care should be taken to plan to have the feeding place as far from the sleeping quarters as conditions will allow, so as to enforce exercise in cold weather.

In order to have the pigs ready for an early market in the fall they should be farrowed in March, the earlier in the month the better. If the sow's next litter comes the first of September, they will be in good shape to market the following April when prices are nearly always good. In this way the brood sows produce two litters a year, and by a little extra care they are ready to sell when the market is usually at its best.

It requires considerable skill to start young pigs without skim-milk, and keep them going until marketed. The faster they grow within reasonable limits the greater will be the profits. One of the important factors in this connection is the sow herself. Unless she is both a good feeder and a good milker, no matter how skillful her care may be satisfactory results can not be obtained. On the other hand given an ideal brood sow unless the feeder is a pig man, he will not be able to feed the sow with the cheaper foods in such a way as to make the sow give her maximum amount of milk and make it agree in all cases with the sucking pigs. Henry has demonstrated that it requires no more food to produce one hundred pounds gain in the pigs when fed to the sow and pigs before weaning than when fed to pigs alone after weaning. This fact would seem to indicate that the more milk the sow can be induced to yield the more rapid will be the economical growth of her pigs. If skimmed milk is available at this time, the difficulties attending the feeding of the brood sow while nursing her pigs is materially lessened. The milk should be fed with grain enough to make a fairly thick slop. Light grains such as white middlings, red dog flour, ground oats with a little corn meal being preferred. Henry also found that it required 230 pounds of mixed grain and 530 pounds of skimmilk to make 100 pounds of gain in young pigs under these conditions at a cost of about \$3.35. If, however, skimmilk is not to be had, a mixture of two parts finely ground oats with one part of wheat bran and one part white middlings with five to ten per cent. of tankage allowed to soak between feeds is a satisfactory ration; to assist in keeping the system open a few roots or access to pasture is desirable.

At the age of about three weeks the little pigs should be encouraged to eat by scattering some shelled corn on a clean floor, or by allowing them access to another pen, or a shallow trough of milk into which has been stirred a few middlings. From now on until they are weaned, their food should be increased and strengthened, care being taken that they have plenty of exercise that they do not become too fat.

At the age of eight weeks the pigs should be ready to wean. This is a crisis in the young pig's life, and the skillful manager will see to it that the pigs are not checked in their development at this time. This can be done providing they are kept warm and dry, that their food is suitable, palatable and properly prepared, and that they are not over-fed at any time. If they are never given quite all they will eat their appetites will keep keen and thus they may be made to eat the maximum amount of food to the best advantage.

From the time the pigs are weaned until they are shipped, the question is to produce the greatest gain at the least expense. This involves not only keeping in close touch with the feed market, selecting the cheapest one and buying when the price is low, but it also involves a knowledge of how to blend the growth producing and fattening foods in such a way as to get a pig large enough to weigh from 225 to 250 when about eight or nine months old.

It is probable that in no way can pork be made more cheaply than with grain on pasture, provided the grain and the pasture is of the right kind. Experiments at a number of different stations have shown that it requires from one-fifth to one-third less grain to produce one hundred pounds of pork with pasture than without it. While this is no doubt true, care should be taken not to try to overdo the matter of pastures, especially with young pigs. Young pigs need more protein than older ones, because they are growing rather than fattening. In consequence, the young pig should receive for sometime after being weaned a ration equivalent to two parts of corn meal and one of middlings, with a little tankage perhaps aside from access to good clover, alfalfa, oats and peas, or cow pea pasture from which he will get considerable protein. On this sort of pasture, as the pigs grow larger, the proportion of corn may be increased until they have attained the weight of about one hundred pounds, when corn alone may be economically fed, unless perchance corn may be high and protein feed proportionately low in price. Under usual conditions, however, the nitrogenous feed are so high that, although their use undoubtedly would make more rapid gains, they are obtained at such an increased cost as to render their use unadvisable. Pigs should be so fed that they will gain from one-half to one pound a day from the time they are three weeks old until they are marketed. It is impossible to make anything like this gain on pasture alone; but on the other hand the Montana Station has found that it is possible to feed more grain than is necessary to make the maximum gains. It seems, too, that in order to get the best results from the pasture it is essential that the pigs be allowed to graze rather than to have the green feed cut and brought to them. Whole grain fed on pasture should be ground or soaked with the possible exception of corn, which may be fed on the cob or shelled. It will pay, however, to soak old corn before it is fed, as soaking is equivalent to grinding and is much cheaper.

It was further found at the Utah Station that pigs in pasture consisting of about half alfalfa and a full grain ration gained 1.3 pounds per day, and that 417 pounds of grain were required for 100 pounds of gain. In pasture and three-fourths grain ration the daily gain was 1.2 pounds and 277 pounds of grain required for 100 pounds of gain. On a half grain ration the daily gain was .87 pounds and 352 pounds

of grain required for 100 pounds of gain. Another rather peculiar conclusion drawn from the Utah Experiments was that exercise alone increased the gain 22 per cent. and the amount eaten but 1.5 per cent., but decreased the amount required for one pound of gain 22 per cent.

It requires considerable skill and forethought to arrange to have desirable pasture during the greater part of the growing season. Assuming that the land devoted to big pasture is fairly fertile, the following plan will perhaps yield satisfactory results under average Pennsylvania conditions where alfalfa is not as yet a certain crop:

The earliest pasture that can be had is rye, and although its food value may not be great, it will serve to tone up the system and induce better appetite and faster growth. Hairy vetch, red clover, oats and peas, rape, gem sorghum, soy beans and cow peas may follow each other. Climate, soil and other conditions will probably serve to exclude some of the crops. It is quite certain, however, that from this list a rotation may be had that will give anywhere in Pennsylvania a succession of suitable pasture for hogs. The great advantage in supplying such a course of pasture is that many of them supply in a very cheap manner, protein which is added for rapid and economical gains.

Growing pork in the winter months is a little more expensive than it is in the summer season. However, we have never had pigs do better than during the winter in open feed lots with Lovejoy houses for shelter. In winter as in summer the ration for growing pigs should contain considerable protein, although not so much is needed in cold weather perhaps as in summer. It has been found that for the most economical gains in pigs the nutritive ratio should be about 1:6.5. Then nutritive ratio of corn is about 1:10. A part of the winter ration can well be composed of alfalfa, or a second growth clover hay cut fine and mixed with meal, or in the case of brood sows be fed from racks.

In some experiments in Nebraska a ration consisting of 80 per cent. corn meal and 20 per cent. chaffed alfalfa produced as much gain as a ration of 80 per cent. corn meal and 20 per cent. middlings. Sugar beets or mangels fed raw in mild weather and cooked in freezing weather can also be used advantageously in winter feeding. Not so much on account of their nutritive value, as to their value to keep the system in such a condition as to increase assimilation.

In regard to the difficulties in growing pork in the East or anywhere else they may all be summed up in the one word—sanitation.

The sanitation of the piggery should be guarded as carefully as the sanitation of a hospital. Damp and illy ventilated sleeping quarters are fatal to pigs and unless the owner will see to it that his hogs always have a dry and well ventilated place to sleep, he had much better keep out of the business. Overcrowding is an evil in pig growing that must be guarded against.

It is my firm belief that at least half, if not more, of the outbreaks of disease are due to overcrowding young shotes. The younger and weaker ones become so unresistant that finally they succumb to the germs of the cholera or swine plague, which I understand are always present even in very healthy pigs. It is simply impossible to crowd young pigs and this point cannot be too strongly emphasized.

AGRICULTURAL EDUCATION.

By HON. M. W. HAYS, *Assistant Secretary of Agriculture, Washington, D. C.*

Ladies and Gentlemen: I am glad to be with you tonight, and I am proud to be with you. I am proud of your great State. I have been living near it recently, and have become better acquainted with it. In my boyhood days I heard much about it from my Pennsylvania German relatives, but it is only recently that I have become personally acquainted with it, and have learned from my own observation how great it really is.

I have just learned from your Secretary this evening that I was down on the program for two speeches. I did not know I was expected here last evening. I received the program with a red pencil mark over Wednesday, the 23rd, and supposed I was to be here for this evening only. I don't know whether the mistake was made at my office, or whether it is to be credited to your Secretary. (Secretary Critchfield says it must have been made at the Washington office, as they use blue pencils there). Well, if that is the case, I am sorry for it, and will have to try and cover the two speeches in my address of this evening.

As each hour has its duties and each tilting of the world's axis has its seasonable work, so each decade brings up for solution its own problems. Our country has taken up one after another such political questions as self-government, freedom of speech, the freeing of a race of slaves and the curbing of dominating capital. In education the first forward movement was to secure private schools, then came the movement for free primary schools. The establishment of academies and colleges followed to be in turn succeeded by a movement to establish free city high schools and normal schools; also State colleges and universities partly or quite free of tuition charges. Each of these types of schools have been devised to form a wheel in the educational machinery which we, as a people, are gradually perfecting.

The educational philosophy of the older, church-governed schools which long ruled our educational policy has been powerfully modified by research in the sciences and by development in the industries, arts and professions. The curriculum once confined to classical learning has broadened out so as to cover the practical as well as the theoretical and the aesthetic. Some of our very best philosophy of education is now found in the minds of those teachers who are successfully reducing to pedagogic form and weaving into our educational scheme the essentials of education in the industries and home making. When the older philosophy met the problems of technical education it said: "Educate the man first and the specialist afterwards." Its plan was to give the man a general college course and give him his technical work in a graduate course. That plan limited technical education to college men. It was the aristocracy of education for the few in the professions. If that philosophy had

been persisted in it would have been the most un-American of foibles. The persistency with which this mistaken policy was pursued was due almost wholly to the fact that school teachers cling most tenaciously to the educational philosophy of the schools where they were taught. Among the most intolerant things done in American life stands out the persistency with which our educators go into a new community and disregard the local interests important and dear to the parent and pupils, placing the school emphasis too nearly all on the remote, as on the possibilities of becoming President, or on the language of a people who knew far less than we, failing to give the youth information about the things with which he or she must deal. But far worse, this course tends actually to rob the pupil of his or her inspiration for the practical affairs of the home, the farm, the shop, or other work in which at least 90 per cent. must engage,

The broader plans coming into our schools have been largely thrust upon the school men by men of affairs, as in our cities and by legislators. The success of combining industrial, technical, and scientific studies with the general studies, thus brought about, often under suggestions from school men, shows that the philosophy of many of the older educators was wrong. The Congress of the United States by passing the land-grant act of 1862 establishing State colleges of agriculture and the mechanic arts, did more than all other agencies to broaden the philosophy adhered to by the older school. At first the mechanics arts were brought to a pedagogic basis; then agriculture slowly but surely was brought to teachable form; and last, home economics were successfully brought into the domain of the school. I believe there are now no administrators of these colleges who are so conservative as not to be thoroughly in sympathy with collegiate education in engineering; most of them have risen to a belief that agriculture has been reduced to teachable form; but some still have little faith in the possibility of teaching domestic subjects. Legislative bodies, ever more ready than teachers to turn our schools into practical lines have their minds open to larger plans for public education. These men who see the broader economic and social movements of our country and our States have come to believe profoundly in scientific, technical, and industrial education and research in relation to our productive industries in relation to home-making and in relation to our social and civic life. As the management of a great railway system is willing to make expensive surveys preparatory to the proper construction at not too great cost of proposed improvements in order that larger net profits may accrue to the road, so our legislators are ready to have the people's money collected and expended in making the people more efficient in creating and enjoying wealth.

The new school movement springing out of the Congressional land-grant act of 1862 offers some facts of interest to legislators and to all who are interested in our youth. These colleges (figures of white pupils only available. Colored schools relating to the industrial are mainly of secondary grade), with 12,334 students in engineering courses, 7,272 in agriculture, and 854 in home economics, most of whom are competing for collegiate degrees cannot offer their training in political studies to more than a very small number of the 26,-

000,000 school children of the country. All will agree that inquiries should be made concerning the best way to supplement these colleges, so as to carry this education down through all the schools, so as to carry instruction and inspiration into all three practical lines of effort to all our youth. As an outgrowth of the engineering departments of these State colleges, instruction in the mechanic arts has been very successfully introduced into the numerous city high schools of the country. Evidence of the utility of the mechanic arts' city high school is arising from the effect they are having on the mechanical industries. Manufacturing firms, for example, are seeking in these schools the young men and young women who show an aptitude for expert work, a genius for invention and new construction, an instinct for managing men, or abilities for promoting and conserving financial affairs. As a result of agricultural work of State colleges more than thirty of the needed two or three hundred agricultural high schools have been organized by the different states, two having established one such school in each Congressional district. Home economics education, first organized in agricultural colleges is rapidly spreading into all city high schools, agricultural high schools as well as privately endowed schools of secondary and higher grade and even into primary schools. In towns and cities too small to establish separate mechanic arts' schools, more or less mechanical and home economics' instruction is introduced often as elective subjects in the regular high school courses of instruction.

The little rural school, so long the most backward in catching step with modern progress, is beginning to take new form. Education in agriculture and home economics once it is fairly started toward all farm boys and girls promises to be too strong for the conservatism of even the isolated rural school. These schools have amply demonstrated that in their present form they can not properly handle these new lines of work. It has been shown that they need to be born over into new life which will fit them for their part—a most important part in the evolution of modern agriculture and modern home-making. The one-room school must become the four-room consolidated school, so that a man trained to teach agriculture and a woman trained to teach home economics may here find that fair wages, and that long tenure of office which will warrant them in thoroughly preparing for their important tasks. The faculty of four or five teachers can conduct a ten-year course extending through the eight primary school years and two years of the high school for the 150 children from as many farms in an area of 25 square miles. The cottage of the principal; the plantations of timber, fruit, vegetable and ornamental plants; the plots for field crops, fertilizer demonstrations and farm management lessons; the laboratory and practice room; and the vital connection the teachers can have by co-operating with parents in the work on the farms and in the homes will weave strongly into the pupils' nature the elements of a true education in country life. With the schools thus organized there is provided in the country a far broader child-life than has yet been conceived for city youth. How can the nation better expend some of its wealth than by thus making provision for well-nigh ideal conditions of fatherhood and motherhood in our

country homes? Two hundred of the needed 40,000 consolidated rural schools have been established, and practical studies in agriculture and home economics are slowly but surely finding their places in them.

Education in the city industries in agriculture and in home economics having become successful elements in our public education, it is not too early to inquire how they may best be brought freely to all American youth. No one can doubt that the introduction of these subjects generally into the secondary and primary schools will materially increase the cost of our public schools, nor that this added cost will several times over return in the greater earnings and in the better homes of the coming generation. Those who have most closely investigated the subject believe that the general adoption of industrial education is in the same category as were the adoption of the steam engine, the self-binder and the sewing machine. The vast expenditures of these mechanical inventions would have seemed more appalling fifty years ago than would now the added cost of industrial education. Our scheme of education for city life is rapidly taking form for the non-agricultural classes in our tripartite system of primary, secondary and higher schools. The great bulk of this work provided for by public taxation is organized under an articulated system of eight years of primary, four years of secondary or high school, four years of collegiate work with one or more added years for graduate courses. The privately endowed schools of primary and secondary grade are no longer rapidly increasing their numbers nor their income, though their value is and will continue to be second to that of the rising public school system. Persons with private funds to give to good causes are more and more recognizing that public funds are to carry the main burden of primary and secondary schools. Even the colleges and universities of non-public character are meeting most powerful rivalry from State colleges and State universities.

The city youth early gains a position on the educational ladder, and with the hope and enthusiasm of youth he looks and climb upward. The system ever leads him on as if all could find occupation at the top. But necessity to labor for sustenance and other causes compels or induces 98.6 out of a hundred (from statistics of attendance in private and public schools and colleges throughout the United States in the 1904 Report of the United States Commissioner of Education) to stop short of the college ladder, and 9.4 out of a hundred to stop before leaving the primary ladder and labor in the fields, shops and homes. Higher education is very important; secondary education even more important; but the great work of the schools must be done in the primary schools. The main function of our secondary and higher schools is clearly to prepare teachers for the primary schools.

The city-life system of education will prepare those who are to continue on their educational course none the less well if the lower schools devoted a fair amount of their time to education relating to the sustaining industries. And there will be a far better self-selection of those who are to continue in school that they may prepare for the pulpit, for the bar, for the teacher's chair, or for the engineer's or technician's post. The wider experience of the pupil who

tests his own powers and interests with the natural, industrial, and home-making objects and subjects will enable him earlier to find himself; so that fewer mistakes in choice of a life vocation may be made.

When our city secondary schools freely offer to all pupils training in the mechanical industries and in home economics, teachers will be trained who know the educational value of these subjects from the standpoints of scholarship, mental power, industrial skill and broad, practical citizenship, and who can successfully introduce these subjects in an elementary way in the higher grades of all our city and town primary schools. Clearly there is need in the curriculum and plan of our city high schools for instruction in practical subjects that those who are to be teachers of our lower schools may have knowledge, interest and inspiration regarding these broad fields of industrial and household work with which most of the people throughout their lives must daily deal, and that very many leaders with higher standards of skill and efficiency may be provided for all our industrial and home-making work. Laborers trained in their work, however simple; artisans skilled in their expert labor; technicians schooled and specialized in their duties; foremen, managers, and heads of manufacturing, transportation, and commercial enterprises more alert to see the inter-relation of industrial processes—the web and woof of our great non-agricultural industries—will make splendid use of a far more highly developed practical school training than our country now provides them.

Country-life education has not had the advantage of centralized population and wealth. It has not developed the needed leaders. Its problems have been more difficult; its organization has been more slow. While the State colleges of agriculture and mechanic arts were designed by Congress to keep agriculture, and our splendid country life at the front, some of these institutions failed for a quarter of a century and more to make a success of their agricultural instruction. Many causes operated to retard the successful development of collegiate courses in agriculture. General education requiring only class rooms, chairs, blackboards and books and scientific education requiring in addition only laboratories became first installed in many of the institutions and long held the chief place in the minds of college presidents and boards of trustees. Entering vigorously upon agricultural education necessitated the additional expenditures for practice laboratories and practical work on the farm, and for expensive herds of live stock and for other costly equipment. The collegiate faculty, most of whom were educated in the older schools, could not resist the temptation to enter a race for large numbers of students with general colleges thus hoping to gain favor with legislatures, and most of the funds were used for demands which could easiest be made popular. Following the ideals of the older educators, the technical and practical studies in agriculture were at first put toward the top of the collegiate courses. The assumption now proved erroneous that the farmer should be afforded as long a course of college study as persons preparing for technical professions. At first there were not so many positions open to the trained agriculturist as to the graduate of the general and scientific courses, which became popular as preparatory college course for

those desiring to take their graduate work in law, medicine and other professions. Lack of a substantial body of agricultural knowledge, and business principles in pedagogic form were also at first a very great hindrance to the development of education in agriculture.

The engineering courses of these colleges on the other hand had less to handicap them. In the various lines of engineering a definite body of knowledge and practice work was early brought together in splendid form for teaching. The rapid growth of industrial, transportation, and merchandising enterprises afforded large numbers of salaried positions to which general and scientific collegiate courses led. Students seeing the halting and unsatisfactory character of instruction in agriculture, naturally flocked to the courses of study which seemed to give them individually the best opening. Presidents and boards of trustees traveling the lines of least resistance responded to the development of general and mechanics arts' courses and failed to secure from the legislatures the large necessary equipment for agricultural education.

During the last one or two decades one State college after another has succeeded in bringing forward its agricultural instruction, and today success has been reached in large proportion of these institutions giving assurance that this class of collegiate education has a grand future.

Success had hardly been attained in collegiate courses in agricultural education when secondary schools for agricultural education began successfully to develop. In 1888 the University of Minnesota began an experiment at developing an agricultural high school course. This experiment is of none the less value, and of all the greater interest because it was an outgrowth of the failure of agricultural courses of collegiate grade to gain a foothold in a State university. Just as Congress by its land-act grant forced colleges of agriculture upon the states, this agricultural high-school movement was injected into the school system upon the initiative of farmers and business men. At present between thirty and forty agricultural high schools have been established in the United States.

In one line of country-life education school men and non-school men have together taken up the practical in school work. Farmers and educators together have entered upon the development of rural schools, as to have them cover agriculture and home economics as well as the three R's. Thus the school people are especially championing the consolidation of rural schools, and the farmers are laying stress upon the introduction of agriculture into all rural schools. Both classes are rapidly coming to favor with both propositions. The farmers are coming to see that agriculture and home economics are to have very strong positions in the primary country-school curriculum along with the three R's.

The need of a unified system of agricultural education with rural schools, agricultural high-school and colleges of agriculture, articulated throughout as are the three classes of primary, secondary and collegiate schools devoted to the education of the city or non-agricultural classes is gaining wide recognition. Courses of study for agriculture and for home economics covering the sixteen years of primary, secondary and collegiate work have been designed, dem-

onstrating that a unified system of education can be built up for country people, and for the professional or technical classes needed in building up the rural industries. To develop country-life education as instruction for our city people is developed, two important changes are necessary. First, there is needed in every rural Congressional district an agricultural high school with capacity to accommodate several hundred students, and second, rural schools should be consolidated. In these two points unanimity of opinion is being slowly but surely reached by those who have paid most attention to this subject; and the next large public expenditure for education made by the American people should be for the consolidation of our rural schools, the development of agricultural high schools, and the development of industrial work in country-life and in our city-life schools.

It is easy to believe that if a way appeared whereby the necessary funds could be provided, all would agree to these important developmental changes. Our farmers say that they cannot afford the expense of discarding the little rural schools and erecting fine central school houses and assume the additional annual expense of hauling their children to and from the consolidated school. Our states even in these prosperous times feel conservative in appropriating the money to equip each of several agricultural high school and the money necessary for the current expense fund of each such school. Our cities and towns during the period when their development expenditures for streets, sewers, waterworks, and general school buildings are large do not feel that they can add to their budgets large items to equip and maintain instruction in mechanic arts and home economics. The States and cities argue that even if free industrial education would pay the community, its cost is more than their present financial ability will warrant.

Investigations to discover how best to finance movements to improve the conditions of our farmers, our city workers, and our homemakers have led to the discovery of a fact worthy of the most serious consideration. In its early days the country being small and jeopardized by external foes, the General Government received the right to levy indirect taxes as on imports on the other hand raise their revenues by more direct taxation as on personal property on the incomes of corporations and of individuals and on inheritances.

It so happens that since the General Government and the State were allowed these sources of income, vast economic changes have taken place placing the Federal Government greatly at an advantage as compared with all the States combined in securing taxes. With the enormous development of manufactured products and the increased power of the people to purchase them, and with the greatly cheapened transportation resulting from the circulation of vastly greater quantities of commodities, the revenues obtained by the Federal Government have enormously increased. The States on the other hand find it impracticable to secure such large amounts of public revenue from the more direct forms of taxation. This is clearly illustrated by the fact that the Federal Government thus secures in taxes revenues amounting annually to \$800,000,000. This is \$10 per capita, or nearly \$50 per family. The States on the other hand annually bring into their State treasuries only \$2 to \$2.50 per capita,

or about \$200,000,000. It should be observed that revenues derived by cities, counties, townships and other political bodies make the State and local taxes presumably somewhat larger than the Federal revenue. The fact that the State legislator is often chosen under pledge to keep down State expenses, while the Federal legislator is expected to secure all he can get for his State from Federal appropriations has not a little to do with the relatively larger growth of the Federal budget.

It may be of interest to note that this centralization of revenue in the hands of the Genral Government is a great force in centralizing governmental power, and if the people had less education or lived in a time less democratic this vast sum secured from indirect taxation might be a fatal danger. On the other hand modern conditions require immense strength and resources at the command of political administrations which every four years must depend for their power upon the vote of the entire people. Not only the outside forces with which our Government might come in conflict, but the vast centers of financial and political influence within the country are gaining such mammoth proportions that the people as a whole agree that a strong government is required that it be more powerful than any rival external or internal.

The productive industries of the country yearly provide the \$800,000,000 which goes into the Federal treasury. If the workers were better prepared for their tasks they could easier provide still larger public funds. Since states, cities and counties and small school districts are handicapped by direct and less popular methods of taxation in securing school funds with which to pay for the expensive work of providing education in the industries it would seem legitimate to use a small part of the national budget for that purpose. Congress has thoroughly established precedent along this line by passing the agricultural college land-grant act of 1862, followed in 1890 with a direct appropriation of \$25,000 to each state for education relating to the industries of the state colleges—thus by gift forced on the people.

It has been proposed that Congress offer to each rural Congressional district \$10,000 annually toward the support of an agricultural high school. In 1887 Congress gave to each state \$15,000 for agricultural experiment work, and in 1906 this amount was made \$30,000 for each state. It has recently been proposed that \$2,500 be offered by the Federal Government toward the support of a branch experiment station at each Congressional district agricultural high school.

It seems only proper to carry the suggestion one step further and suggest that Government aid should be extended also to industrial education in mechanic arts and home economies in the city and town high school. Under this plan a Congressional law has been suggested under which, say, 10 cents per capita, or a total of \$8,000,000 annually might be apportioned to agricultural high schools and to city high schools. The payment of this fund from the Federal treasury could be conditioned on the State supplying the necessary lands, buildings, and equipment, and on the appropriation by the respective states of sums equal to their allotment from the General Government. The law could be made to stipulate that the Federal fund be used only for actual work in classes devoted to the industries and domestic work.

That some comprehensive scheme of financing industrial education is necessary can hardly be doubted by those acquainted with those communities most backward from an industrial standpoint as in the South and West, and in thinly settled districts as in mountainous regions.

Even Pennsylvania would receive an impulse of vast importance from a measure of this kind. Such action on the part of the Federal Government would be of untold benefit to the country people of this state. Her manufactures also would gain a new impetus from thus inaugurating throughout her high school system mechanic arts' education. Education in home economics thus made possible to every girl in the state would still further exalt home-making and motherhood in the Keystone State.

Taking round numbers from the Twelfth Census, Pennsylvania stands among the states second in manufactures only to New York. In agriculture she stands eighth. She had 928,000 workers in mechanical industries and 341,000 in agriculture, practically three to one. In trade and transportation she had 454,000 workers; in professional service 103,000, and in domestic and personal service, 556,000. Of her 6,302,000 people there were of school age 2,031,000, or practically one in every three, half of which number 1,084,000 were in school.

The figures are not available to show the school expenditure for the five classes respectively. It is conservative to estimate that the 103,000 professional workers have had school facilities from public funds and from private endowments equal to those provided to several times as many workers in the industries. Educators are rightfully urging that more money be supplied to equip the colleges and universities which devote their energies mainly to educating people for the professions. Indirectly by training teachers for the lower schools these higher institutions of learning have a very large influence in educating the workers. Colleges and universities have had their great day of promotion, and they have reached a point where their very substantial equipment and liberal support are assured. The professional class is about 5 per cent. of the whole number of workers. In education they appear as a privileged class. They should not be given less, but more; but the great movement now needed is to give of the world's rapidly accumulating store of technical knowledge to the workers and to add to this knowledge skill. There is now no line of work for which a technique is not being rapidly developed. In agriculture, in the mechanical industries, and in home economics the body of accumulating scientific artisan, and art knowledge is being reduced to pedagogical form. Studies in this great triumvirate of practical affairs (mechanic arts, agriculture and domestic economy) are forcing in beside the three R's and the resulting sextette will so broaden out the knowledge, the industrial skill, and the productive and home-making efficiency of the whole people that every class will have a richer world to live in.

Pennsylvania has about one-fourth of her industrial workers engaged in agricultural pursuits with three-fourths in manufacturing and mechanical pursuits and in transportation. If Pennsylvania

were provided with a fund from the Federal treasury equal to 10 cents per capita of the entire population, and one-fourth of it were put into technical education in agricultural high schools and three-fourths into technical education in city schools, and the state were required to expend an equal amount along these lines, the evolution of agricultural and mechanical trades and industries would be rapid, and the results to Pennsylvania's income and civilization would be both extensive and profoundly beneficial.

Mechanic arts' education thus extensively supported would result in much stronger leadership in the engineering professions and in the business management of Pennsylvania's industrial and transportation enterprises. Every boy in the state with strong instincts along any of these lines would then have the opportunity of the largest development of which his nature is capable. Ten agricultural high schools in the state, each provided with \$15,000 from an outside source, and \$15,000 from the state would send to the agricultural college course at State College, splendidly prepared, all the men the state needs to train in collegiate courses for professional work in its agriculture with a surplus for National service along this line.

These schools should graduate from high school courses a thousand of the farm youth every year or 35,000 every generation. We will doubt that such a body of people trained in rural business and country home-making would not push Pennsylvania agriculture to altitudes not yet dreamed of? Would such an army of people trained in country-life education stop short of a splendidly organized system of a thousand consolidated rural schools and as many well-developed single-room schools in isolated mountain districts? From this body of young people what a splendid corps of teachers could be provided to install country life education in these rural schools.

Under this plan a city of 100,000 population would receive \$10,000 to which it would add at least an equal amount to be used in studies in the mechanic arts and in the household industries. Thus the city schools of Pennsylvania would not only grade up the efficiency of the industrial workers and home-makers, but would send to the mechanic arts' collegiate courses in State College, or at the University of Pennsylvania and other colleges offering engineering courses young men better self-selected and better trained to go forward in their preparation for the engineering professions. Even the other collegiate courses of these institutions would be benefitted by having a better selection of youth to enter the collegiate, scientific, literary, theological and related courses of study. Besides our modern conditions require that the scientist, the writer and the theologian know the practical sides of the lives of the people for whom they experiment, write and preach.

With large public funds thus provided for the practical in education, the less expensive but hardly less important line of education in home economics would receive the impetus it so richly deserves. No one who has had an intimate acquaintance with the developments of this line of education during the past twenty years will doubt the assertion that 10 per cent. of the large sums of money suggested for industrial education if applied to instruction in home economics in all the public secondary schools as thus suggested for city and country would easily bring back to the people more than the entire cost.

While Congress inaugurated industrial education; while Minnesota has the credit of designing a successful course of agricultural high-school work; while a number of our cities as Philadelphia, Brooklyn, St. Paul, St. Louis, and Chicago have proven mechanic arts' high schools to be practicable; and while Ohio, Indiana, and other states have made practicable that most difficult of changes the consolidation of the rural schools; and while Alabama has the credit of being first to locate an agricultural high school in each Congressional district the great Southern state of Georgia has the proud distinction of first proceeding to finance a system of agricultural high schools throughout the state. Last July the legislature of Georgia passed an act authorizing Governor Terrell to locate an agricultural high school in each of the eleven Congressional districts of the state, and turned over the funds reserved as tag taxes on fertilizers and oils for their use as an annual support fund. The act required the people of the respective districts to furnish farms, buildings and equipments. Governor Terrell secured experts to aid in the selection of farms suitable for school and branch experiment station work. He employed an architect to prepare a bird's-eye view of campus and buildings, and he called upon educators who aided in devising a course of study devoted especially to agriculture and home economics, and particularly with the rural schools below, and with the farm, and at the same time leading toward the collegiate agricultural course in the University of Georgia.

The people of Georgia were thus so fully aroused to the importance of these schools that the bids of different cities and counties for them reached figures which put our rich Northern states in the shade. All but one of the eleven schools have been located, and what will be the bid for the last one is pretty well known. The total thus given almost wholly by individual subscribers for the 200 or 300-acre farms for buildings and equipments amounts to over \$800,000—more than \$70,000 with which to equip each school.

Is it any wonder that this magnificent response by the people of Georgia to his appeal to thus use modern technical education to bring still higher her rising industries and home-making led Governor Terrell to suggest to his Congressmen to secure a Federal grant for more money with which to supply to these schools and for a branch experiment station at each school a more nearly adequate annual expense fund?

America has no state more able than Pennsylvania to take a strong pace in the development of industrial education. Building up a system of education in the city industries, in agriculture and in home-making will cost additional funds. But the expenditures to make more efficient the producers of wealth and the home makers who devote themselves largely to the development of people will pay back their cost several times over. Our statesmen and our educators have before them no more important problem than that of financing a plan of industrial education which is educationally correct. More experiments are needed that we may know how to develop industrial education. Of especial importance are experiments to determine how best to organize education in agricultural and home economics in consolidated schools. Pennsylvania's law passed several years ago providing for the consolidation of rural

schools should furnish excellent conditions for such experiments. The rural school being far the most important of all schools devoted to country life should be studied by actual experiments. No other one object in agriculture is so much in need of investigation. Possibly legislative bodies and men in practical affairs must make the first move, as in the creation of agricultural colleges and as in financing agricultural high schools.

Mr. Chairman, I think I have talked too long. I am glad to be here and see the faces of men like your Secretary, Mr. Critchfield, whom I have just met, and of Dr. Armsby in whose class I used to be when I went to college (not that I mean to imply that he is old), and of Dr. Hunt, the man among all other men best fitted to the position to which he was called. I should like to say more about these people, but I have already talked too long, and I thank you for your attention.

PENNSYLVANIA STOCKMEN AND MEAT INSPECTION LAW.

by DR. THOMAS F. HUNT, *State College, Pa.*

Mr. Chairman, Ladies and Gentlemen: Eight years ago I stood one Sunday on the Great Salt Air Bathing Pavilion at Salt Lake City, and looked over that broad stretch of country, and I thought of Dickens' remark that he did not know anything deadier than a door nail except a coffin nail. He could not have stood where I did, and looked over that vast stretch of country without a sign of living vegetation, and standing there, looking over that broad stretch of dead country, you can judge my surprise when I found later that that broad area of dead land of which I am speaking was once laid out in fertile farms that were the pride of the early settlers of Salt Lake City. But the vegetation failed through lack of irrigation in that land of the alkali, wherein no living thing can flourish without it, and the farmer moved off. Now, that is a particularly striking illustration, and I use it to show you the foes that have surrounded the alkali sections of the United States.

Then, I took the train for San Francisco, and if you read the glowing account of the railroad circulars, you will expect to find yourself at once in the beautiful valley of the Sierra Nevada; they give you a fine description of it, but they fail to say anything about the two nights and days you must spend in travelling through the alkali desert where the alkali dust almost chokes you, and there is no sign of any living thing.

Well, the next morning I got up, and I asked "What State is this?" and they said "It is Utah;" I said "Why, I thought I was in California by this time," and they said "No, this is Utah yet." Then I asked them "Is not this the trail of the Forty-niner?" They told me it was, and looking over that vast expanse of desert, where there is no living thing, I said "But how could he get through here alive?" He had horses, for there were no trains, and he could not travel

on foot all that distance, and supplies must be taken along; and probably he had his family with it. How could he ever get across this desert? There is nothing to support animal life, and no living plant or tree. Well, the rest of the passengers were tenderfoots like myself, and no one could answer that question. The conductor could not enlighten me, but finally a man who said he was an engineer, and had engineered all through that country said, "I can explain that to you." He said "When the Forty-niner went over there the grass was knee deep. These were the sheep pastures of Nevada, right along here, where we are now running." (Mr. Wing was there and can tell you whether or not I am right; this is the engineer's history, and I don't know whether I am right). He said in the first place came the cattle man, and got possession of the land when the grass was knee high, selecting the places where there was grass (there was water there) was all the title required so far as he was concerned, and the next cattleman who came along took the same thing. Now, he had the cattle, but he did not figure on the sheepman. Then he came along and I have been told by men out there that the sheep can go thirty days without water, and I do know that the sheep can get ahead of the cattle on the water proposition. And no cattle will follow sheep in large numbers. Then, he said, it rains sometimes out here, and you people who have not lived here know nothing about this abode mud; it is worse than anything you ever saw. The sheep you know, not only eats the grass like cattle, but he will burrow down and pull out the roots, and they pulled out the roots of the grass and trod down this abode mud so hard that where there was grass knee high in the days of the Forty-niner, there is now neither grass, nettle, nor jack rabbits. So I began to notice more particularly. I had supposed that this country, this one-third of the United States west of Denver was to be the feeding place of the whole United States, that we were to go there and get our young cattle and bring them east. That was what I supposed eight years ago, but when I looked at it, it looked different. I can bring it home to you. Let me give you a few illustrations to call it to your attention.

What is contained in the State of Nevada? I went up to Carson Lake and took the stage down to Carson City. Along the stage line I saw a "V" shaped box, and in that box was running water. I kept looking at it and wondering what it was. Finally I summoned up courage enough to ask the only other passenger on board, who was a woman, what it was. "Why," she said, "this is a flume." I said "What is a flume?" "Why," she said, "that flume brought down wood from the mountains to the box factory at Carson City," "Oh," I said, "there is a box factory at Carson City?" "No," she said, "there is none there now." I said "Why not?" I suppose she thought by that time I was a fool, but she said "We have no wood." I was afraid to ask any more questions, so I kept on looking and at Reno, Nevada, I asked a man why it was that there was no lumber in that part of the state, and he told me that Mackay, the lumber king, had over two hundred and fifty men at work up there day after day for more than four years cutting that wood. I went up to Reno by train. The train stopped; I have never learned why it stopped, because I didn't see any house. So I said "What is this

place?" They said it used to be a mining town of two thousand inhabitants, but it is all gone now. There is no wood, no tree, no vegetation there, and so they have gone. Now you can see why it is that Nevada, several times the size of the State of Pennsylvania has a population about the size of this city of Harrisburg, and it was less in population in 1900 than it was in 1890. I am not saying this to disparage any one, but I only want to bring home to you this proposition. As a matter of fact, that trip made an Easterner of me, and set my feet in the opposite direction, when I came to look at the surrounding country. I had gone West with the intention of staying there, but I came back East, after I had gone over that country determined to stay East.

A little over a century ago men began to go over the Allegheny mountains into the new country beyond. Then, from 1800 to 1850, they spread into Ohio and Kentucky, and perhaps Illinois, and they flourished at your expense. Why? For two reasons; one was that it was a new country, fresh and undeveloped, and your young blood went out to develop it. Then came the Civil War, and after that was over the stream of population crossed the Mississippi. Heretofore the people of the United States had dug out their homes from the forest; then they came out with plows, and turned a furrow or two and made a home; then came the self-binder, and then other improved farm machinery, making it easy to make a home, and from 1870 to 1900 the population of the United States doubled, and in these thirty years the agricultural industry developed.

What does that mean? Why, it means that in thirty years these people of the United States were compelled to produce as much as they had done in 250 years before. For one hundred years these people out there have been competing with you because they have had cheap lands with fresh soil, and because they had your fresh young blood to develop it, and they raised cattle out there at practically no cost whatever. Take the illustration I have frequently used of the Jew peddler who went to Deadwood thirty years ago, and distributed a few cattle on the public land there. A few years later he had 20,000 and then 300,000 of cattle worth \$3,000,000, every dollar of which he made by distributing cattle on Government lands. It was easy for these people to ship cattle into this new country take them off the train and distribute them on that land, and then ship them back at \$2 a head, you, of course, to stand the loss. I spoke to a Westerner about raising cattle in the East, and he laughed at me, and said "You go back and teach those Eastern farmers to make Jersey cream."

Now, here, gentlemen, is this proposition: This Eastern country is adapted to the raising of trees and grass; the Western country is adapted to the raising of corn cheaper and cereals. Then we have the great Central West, between Pittsburg and Denver. And when proper economic conditions are developed regarding the raising of grass and trees, and the cutting down of the trees is stopped, the tree and grass men in the North Atlantic states must flourish. Pennsylvania and New York will make great horticultural states, because they have the trees, and the time is coming very rapidly, I believe, when this will be the cattle producing country, and the West be better adapted to doing some other thing—not that it is not a good country; I would not say anything against that part of

the country—but it is better adapted to doing other things, and we need not send our young blood out there to develop it. It has got to be developed at its own expense. You have been doing that for a hundred years. You could not help it. No one could. For the last hundred years they have raised stock so cheaply that you could not compete with them. Some of you have not had stock enough to keep up the fertility of your land, but just as soon as you have more stock on your land you will raise more corn and more wheat, and you can afford to keep more stock because you are going to be paid better than you have been. Some of the people here have thought that the only thing that is going to continue in livestock is raising milk and butter and shipping it to city markets; that the meat business is out of it. Now, the fact is that these Eastern states are better adapted for raising meat stock than they are for dairy stock. They are better adapted to raising grass than cereals. In Nebraska there are 32,000 hand separators; out there where you have been thinking of them only as raising steers they are milking cows, and sending their milk in some instances five hundred miles to be made into butter. Three creameries in the state make ninety per cent. of the butter made in that state. You have competition in dairying, and there is coming about a re-adjustment of the livestock conditions of this country.

Now, there is one other thing I want to call your attention to; some one has referred to what "Teddy" thinks, and this brings home to me the fact that they have been quite busy in Washington lately. They have passed two very important laws. In my mind they are more important than most people realize. They have passed the National Pure Food Law, and they have passed the Meat Inspection Law. It is going to make a difference, I think. I went into one of the big packing houses in Chicago, and when the head man of the house showed me about, he took me to the department where they make bone handles for knives. The girl in charge showed me how they were made, and "These we make into bone handles," she said, "and" showing me some other, "those made in this way are the imitation stag horn, and those," showing me a third lot, "are real stag horn." The girl was perfectly honest in her endeavor to make things plain to me. Now, the other day I bought this knife of a perfectly honest young man as genuine stag horn. Now, it does not make any difference to me whether I carry a knife with a handle of of genuine stag horn or not, but it does make a difference when I eat a piece of meat whether it has poison in it or not. It makes a difference to me when I eat sausage whether I eat so many pounds of sausage, or so many pounds of sausage mixed with so many pounds of potatoes, and so many pounds of water. I was told in this same packing house that there was no kind of sausage in the world that they could not supply, and I have a letter in which they enumerated sixteen kinds which they make, and many other kinds which they do not care to mention, for fear of hurting the trade. Here is the point: This is the Pennsylvania farmer's opportunity to put on the market a good article.

Now, gentlemen, you cannot buy Evaporated Cream any longer; it will be just plain Evaporated Milk. You cannot buy colored peas; if you put colored matter on the market some one will find it out,

and you will be out of business. But, you say, if we put a good article on the market some one will put it out of the market. That has been the case for the last fifty years, but I believe that from now on is going to be the opportunity to raise the finer articles—a greater opportunity than ever before. I believe there is going to be a discriminating public, who will be willing to pay a good price for it if they are sure of getting the genuine article. I believe that instead of a few large packing houses—I have nothing to say against them, for they are all right in their places—but I believe that instead of a few large packing houses, there will be scattered throughout Pennsylvania small abattoirs, perhaps co-partnership abattoirs, the same as co-partnership creameries, and they will say “You can get genuine sausage there, and can get it fresh every day and inspected” just the same as the creameries. There will be some disadvantages, but there will also be some advantages, and the bones and fertilizers instead of being shipped from Chicago will be right here, and I believe from now on is the day of the Pennsylvania farmer, you will produce more and more of the meat products; there will be less and less competition from the West, and instead of being confined to a local market there is going to be a demand for your products, and you are going to lead in producing a good article. I am not interested in cattle; you know I am looked upon as an Agronomist; I am interested in raising crops, but there is an old Flemish proverb that says “No grass, no cattle; no cattle, no manure; no manure, no crops.” and this I think you will find holds true, and since they are all interwoven, I hope the Pennsylvania farmer will take hold of his opportunity, and turn his attention to the raising of cattle for the market that is sure to come for him—is coming now.

PRESIDENT NORTON: This paper is now open for discussion.

MR. WING: Mr. Chairman, it does not seem to me that we should allow that splendid address to go without a little discussion, especially as it is the most vital one that has been touched upon at this meeting. The question is, Are you up against it? The time has come for the farmer in Pennsylvania and Ohio to wake up to their opportunities. For some years farming had rather fallen into disrepute in our Eastern states; there was too little in it. In Ohio I have seen corn sell at 16 cents per bushel—a case of 16 to 1. But there is a better day at hand. These conditions in the West of which Prof. Hunt speaks—the disappearance of the grass out there—are all true, and more true than he has told you.

I spent a month in Colorado recently, and looked over conditions there. They saw something must be done there, and how to do them well. They work harder than lower, and I saw the farm fences going down, you do here, but they have the faith to overcome the necessary obstacles, and will find a way. They have sent the price of land up in the San Luis Valley to \$175 to \$200 an acre; it is worth that now at Fort Collins. They have faith, these people. I said to them, “But look at the distance from the market.” They said, “That is easily overcome with transportation facilities.” And they said, “We can raise four or five tons of alfalfa to the acre and get three crops.” I said, “I can do that in Ohio. What do you get for it?” They said \$5; I said, “I get \$12 in Ohio.” I said, “I can raise

75 bushels of wheat to the acre and some men get a hundred." They said, "We can't do that but we can grow corn, and get an average of 80 bushels to the acre." And they take this to market long ways in teams, but they have faith in their future, and courage to work hard for less money than we people get here. Now, do you see why they succeed there?

Several years ago it was my privilege to go across the water. I guess I was always a pessimist. I remember when I was a boy—I was born in Ohio—and I can remember when a farmer got 11 cents for his hogs, which he had fed on his farm, and sold his steers at \$90 to \$120 a head, and once when I was a little boy, I was sent with some of them to a neighboring farmer, and when I got them there, the old man gave me a dollar. I tell you I was proud. When wheat got down to \$1.25 the farmer's said, "Times are getting poor now." They kept on growing poorer and poorer, and the farmer began to average only forty bushels to the acre and then twenty-four. Then I bought a field next to ours that I had been wanting for a long time; it had got down to where I could handle it. I have that field now. But the average yield grew smaller, prices grew and the paint wearing off the houses, and the mortgage on the farm grew greater rather than smaller, and I remember riding along in the train and seeing the old houses growing shabbier, and the old farmers getting white-headed, and I said to myself "Agriculture is doomed here; the richer west is getting richer, and the poor farmers here are getting poorer, and there is nothing left for them at all." Soon, however, times began to pick up in Ohio, and they began to pick up here, and today times are much better than they were then. But still it seemed to me that the soil was impoverished, and then I began to think of it, and it struck me that this was new soil; it could not be worn out; it had been in use less than five hundred years—much less in most places—while in Europe the farmers have been farming the same soil for centuries, and are still farming it, and just about then I had the opportunity to go over to the old world, and I started in England, and then went down to the Isle of Jersey, and then over into France, and the one thing I wanted to see was how they could have lived on the land so long, and could still continue to live on it, and it was the most marvellous thing I ever saw. In France I saw the finest farms I have ever seen; the next were in Scotland, and I don't know whether Scotland was not better, even on the whole than France. But in France, where I stopped, there was an old Frenchman, who offered to take me some miles out of Paris to see a fine farm which he knew, having come from that neighborhood. So one beautiful morning we started out by train. Now, the old Frenchman could not talk any English, and I knew about three words of French, but we talked all the way. When we saw anything that did not please us, we frowned, and shook our heads, and when something particularly attractive came under our notice we smiled, and shrugged our shoulders, and we understood each other. When we got there, we went directly out into the fields, and I can assure you I have never seen a finer sight than that field presented that morning. There was the wheat as high as the backs of his oxen; one man went alongside three yoke of oxen, one man driving, and an American binder doing the work. A little beyond this was another field,

and I don't think I have ever seen quite so many clovers mixed together—the Crimson Clover, and the Red Clover, and the Alsike Clover, and then the Alfalfa—some fields were alfalfa entirely. Here were men mowing with old-fashioned scythes with a short straight blade, very unlike those used in America in former days. I asked the man to let me try it, but found I could do nothing with it, although I have mowed many an hour with the long curved scythe that was used in this country. Then behind the mowers came the women, and they raked the grass together in little bunches and set them up in little shocks. Wonderful grass it was; I have never seen anything like it in my life, and the green fields and the fragrant clover; it covered maybe twenty or thirty acres and it was of marvelous growth.

The farm hands lived in little stone houses which they owned; many of them had lived on this farm all their life and their fathers before them. They did not own the land; that belonged to the farmer, but they owned their houses and did the work by the job. This was an unusually large farm, about thirty thousand acres; it had an immense barn, and I saw where the cows were pastured, and I saw where the 2,000 sheep were kept.

Up you drove through a big, wide gateway to the castle, erected centuries ago, passing the big stable where they had those wonderful cows that made the milk and cream for the Paris markets to the north end of it, which was the residence part, the residence of the man who owned the castle and the farm. He was worth probably \$13,000,000. He asked me into the house and there I found a lady that spoke English, and I spent the afternoon in going through that magnificent old castle with its fine art galleries, and elegant libraries, its collections of armor a thousand years old, in the grand old halls with the windows down to the floor; but there was one peculiarity about those windows; every window on every side of the castle looked out on the same thing and what do you think that was? They could see the cows go out to pasture in the morning in those marvelous fields, and they could see the sheep at play in the fields beyond, but from every window they could also see a great pile of manure—the greatest pile I have ever seen; two piles, each one as big as this room, sprinkled over with some composition to deodorize it. Not a very aesthetic object, but one worth a million dollars to that old Frenchman, and I am sure that every time he looked at it he said, "How proud I am of this pile of manure; it feeds my family; it feeds my laborers, and my cattle by feeding the land; it is one of my greatest treasures."

I finally got away from these people and went out into the fields again, and pressed my foot into the soil, and it ground out rich and brittle; and I said to myself, "Here is land that was old a thousand years ago, and is still more fertile than anything you have ever seen, while out in Ohio you think that new soil is worn out." And I said to myself, "Joe Wing, learn a lesson from that old Frenchman's manure pile, and go home and put it into practice on your land, and some day your land will be so much more fertile that there will be no comparison between the two."

PRESIDENT NORTON: Any further discussion?

DR. PEARSON. It has been a great privilege to listen to these addresses of Prof. Hunt and Mr. Wing. I have for years maintained that the farmers of Pennsylvania have been oppressed by an unjustifiable spirit of depression. It is not justifiable. I used to think, like Prof. Hunt, that the West was the great cattle breeding district, and that it would for a long time to come be our source of supply, but I was impressed during a recent trip to Montana, which is one of the great cattle raising states, as to what the condition really is of the cattle breeding industry. In Minnesota which has three times the acreage of Pennsylvania they can not breed cattle and horses enough for their use. They are buying horses in Chicago and taking them West. We are not introducing our horses, but they are getting them.

The good land has all been taken up in the West; there is no more good land; there is no more pasture; and the great cattle industry of the West has passed to the farmers of the East. In talking with some stockmen in Montana, I spoke of the small development of the livestock industry in that state they said "Wait until you get to the Big Hole country; you will see there the finest and the best cattle you ever saw." So I waited until I got to the Big Hole Valley, and what did I find there? About 20,000 good steers, and 40,000 were distributed from the stockyards at Lancaster last year to feed on the pasture of Lancaster county, and we don't boast of it and most people don't know of it.

In the matter of beef I think there is something we have overlooked. I think Mr. Wing will agree with me that if the Pennsylvania and Ohio farmers would raise Shorthorns they would find them a profitable investment. It costs the Western ranchman from \$10 to \$12 to produce a calf, and if our Eastern farmers were to grow Shorthorns they can usually market them in a year. If they are extra good they are retained over another year, but where the herds are retained there is very little attention paid to the calf, and the bull is sold to the morgue. And if our dairymen would grow Shorthorns, or Herefords, and keep the beef bulls they would raise a beef quality better than that of the West. These calves are sold at \$2.50. In other words, the Eastern farmer can buy for \$2.50 what it costs the Western ranchman \$8 or \$10, or \$12 to produce. Of course, there is the calf to raise, but in some districts the skimmilk comes back, and on this the calf can be raised, and I believe that we can compete successfully with the beef interest of the West if we will but keep this in view.

Then we have another interest in this State which is not always considered, and that is we are constantly purchasing and bringing to our farms the surplus fertility of the West. As Prof. Hopkins explained, most of the crops that are being harvested in the West contain a large proportion of nitrogen and phosphorus, and we are buying them and getting the benefit of it, and when we raise beef we do so very often without any regard to the manure as a return.

Prof. Hunt spoke in a very interesting manner of the future of Pennsylvania as affected by the new meat inspection law. I want to call your attention to a defect in this law making an appropriation of \$3,000,000 per year for the inspection of meat for export or interstate use. The appropriation gives Pennsylvania a propor-

tion of over \$250,000. Now, I was told by a stock breeder recently that the inspection of the large packing houses is becoming more and more stringent. He told me that Armour's men had orders to condemn any steer was not absolutely perfect. What difference does that make? Just this: before the meat inspection law they could ship this meat anywhere, but now they dare not use it for interstate or export purposes. So they ship the steers that will not do for export trade to a firm that is doing business entirely within the state in which it is located, and cannot, therefore, be put under Federal control, because it does not an export or interstate business. There are a great many packing houses in Pennsylvania; under Federal inspection the buyer for a firm doing export or interstate business would not take any consignment that does not fully pass requirements, but the man who does business within the state alone can do it, and does do it. So this law is not all that it is intended to be and the appropriation of \$250,000 does not touch the small fellow, and he will continue to do business in his own way unless this law of the United States government is supplemented by state meat inspection laws. The people of the United States want inspected meats, or they do not want them. If they do not want them there is no reason why the Federal government should spend \$3,000,000 a year for inspecting their meat. If they do want them it is necessary to take action in the several states, and then use the appropriations for enforcing these laws.

"THE GOLDEN HOOF."

By MR. JOSEPH WING, *Mechanicsburg, O.*

Mr. Chairman, Ladies and Gentlemen: I am glad to have an opportunity to talk to you about the sheep. It is a good subject, and we will see what we can make out of it in the time before us. Some times I write my speeches and read them, but it was very discouraging to see people grow tired before I got through, so I have given it up, and when I see that they become tired of the subject, I stop talking.

I am going to outline for you the kind of husbandry that will pay the small farmer in Pennsylvania. The kind of sheep ranching that is done in the West will not do here. There the man who has only 10,000 ewes does not count for much in the business.

Now, the man with 10,000 ewes cannot lamb until the grass grows. That will not be before May or June, and there will be more lambs born in June than in May. Of course, he has a little anxious time while the lambs are coming, but there will be a man with every thousand sheep, and besides seeing that they do not suffer from the temperature at night, and that they are protected from wet weather, they do not want to be disturbed very much during this time. After the lambs are born it is a little easier time then, but the

men have the extra herd on their hands until the earliest lambs are old enough to go to market. They have to see that they do not get into the alfalfa fields, or the corn fields, and these little fellows slip through very easily. Once they get in it is very easy to see where a sheep has stood. The Eastern market for the Western farmer begins in August or September, but the heaviest market comes in October, November and December. We used to buy tiny little bits of fellows and take them home and feed them on alfalfa and raise them, but it is getting harder and harder to get them. I remember not so many years ago buying very nice ones at \$2.75 per hundred pounds, live weight; this year I paid \$6.35, and I had 1,400 of them. It took some faith, and I almost thought "I can't do it."

Now, the men of Pennsylvania have more sense than to try to compete with the Western ranchmen. They can't do it very well. You have your grain here on your land, and you run the danger of stomach worms. You may get in in time if you have alfalfa, but the corn growers can't do it. So the thing for the Eastern farmer to do is to raise his lambs earlier, and get into the market before the western lambs are ready to be marketed. Then he will have no competition from the West, and can get a good market and good prices.

Now, I think it will pay the Pennsylvania farmer to have one hundred ewes. That is a nice little lot to take care of. He need not learn to know them all by name, but he can know them all by sight.

I am not talking to you about the winter lamb business now; I am going to talk to you how the ordinary farmer can manage to make money on sheep in Pennsylvania.

He should begin in February or March, and first I want to talk to you a little about taking care of the ewes in pregnancy. That is the thing most people know little about. I love to talk about it, because I have had so much experience with it. I had the benefit of that when I was a young man and had a young wife, and a nice lot of sheep, and I was as happy as I could be. I kept my sheep very carefully housed and protected from the weather, and led them out to water, and took all the care of them that I knew how. I had read a great deal about the value of protein in the feed and bone meal, and of wheat bran and clover hay, and oats sometimes, and I never saw anything prettier than that bunch of sheep. But when the lambs came then the clouds came over my sun. Feeding so much protein had developed too much bone, and the lambs could hardly be born at all. I remember one weighing seventeen pounds, but the mother died and the lamb died. I took it into the house and nursed it and fed it, but it died. The lamb died because I did not know how to feed. Well, an old man who had raised sheep for many years said to me, "You take too good care of your sheep, let them hustle, and give them oat straw. You have wasted your feed by giving them too much." So I gave them oat straw and a little corn fodder, and they looked fine and well rounded out, but there was something not quite right. You can learn to tell that in your sheep just as a man learns to know when his wife is mad. At first he needs a diagram to show him, but after while he learns it

instinctively. Well, the lambs came, and they looked all right; there was nothing wrong to be seen but they did not live. That ewe did not have that lamb at the physiological moment; there are forces at work in her beyond the care of man, and I learned then that this wonderful thing, that if the ewe did not have milk in her udder, she did not love her lamb either. I have had an old ewe look at me, and then at the lamb, and say as plainly as she could talk, "Joe, here is that lamb; I have no use for it; you had better take care of it." And I have tried it many times, and have nursed those lambs and fed them, and done my best to raise them, but rarely with success. And I learned this then, that if a ewe does not have milk in her udder she does not have any love in her heart, either, and these ewes did not have milk in their udders because they did not have these lambs at the physiological moment.

Then I thought if I was careful to get a good sire, my lambs would be all right; so I exercised great care to get good sires. Then, one day I had a lamb born, and the moment it was born it looked around very lively, and found its dinner, and enjoyed it, and I said "That lamb has strength, and it is going to live," but it died. Its father lived, and its mother lived, and all its kindred. It would take a special story to tell how too much strength is not good—how it is almost as bad as too little.

Now, we have learned how the lambs should be born, and we will go back to our ewe. We keep that ewe carefully housed and protected from the wet weather, and we feed her up with alfalfa and wheat, and yet not one of those lambs will live. Why? She gets no exercise; she stands too much, and not one of those lambs will live. Keep her out of doors, and give her exercise and feed her well, but not too well, and see if those lambs will not live. Our sheep must not be exposed to the weather, but they must not be kept too warm. You can't raise sheep in this way. I have a neighbor who has a barn worth \$3,000, and he has never raised a single sheep in it. He keeps it closed too tight, and his sheep get no air. You need the air.

Now, a man who has sheep should have a lot of little panels made, about $3\frac{1}{2}$ feet long, and fitted with two little doors to keep the lambs together. You can fold these panels up and put them away when you don't want them.

When the first sheep are born, I tell you it is a busy time for the shepherd. The ewe may have twins—she probably will—and all the better. Take her into the barn, and put her into this little panel pen, so that she will have room to move about with her lambs, and then you can take care of her. It is very nice to turn her over, and start milking her, so that the lambs can get their first milk, but we have not time to talk about that. You put her into this pen, with her lambs, so that they will not be able to get out and run around among others. Never allow them to get out among the sheep that have not yet born their lambs.

Never give the ewe any change in her feed, and no increase. It may cause a great many troubles, and give her indigestion to give her anything different, but gradually decrease it while seeing that she still has enough to eat. It is a common mistake to give her some protein, and some wheat bran, and some alfalfa, thinking that will make milk.

Now, if you think the lambs cannot suck all the milk out so as to get a fresh supply next time, it is wise to milk her for few days until the lambs get bigger.

Now, another thing: I am pretty near getting to the winter lamb business, but I want to start you right for the spring, and then we will start on that in the same way. Make a place where the lambs can go in and the ewes can't follow, and make it so that they can get in easier than out. The lamb is the creature of opportunity. Most men are like them, and some of you men here will probably go to the legislature some day, and some will probably go to the prison; it all depends upon your opportunity. So, if the lamb has the opportunity to go into this place he will do so. Place in that pen a little trough, and in that trough some grain—wheat bran will do, or a little corn meal, very coarse ground, or about ten per cent. oil meal or buckwheat. It doesn't take long for these little fellows to get started eating the grain, and I tell you they enjoy it. Then comes the grass in the field, and here is something I want to impress upon you; keep them off the grass when it is growing. When you turn them out of the pen, turn them into a little yard, and keep it bright and clean, and when you give them grass, feed it to them on the ground. Why? There is nothing in the grass beyond a little coloring matter, but until he gets something to do, he does not need very much of it. When I was ranching in the West, our only anxious time was in the spring when the time came for the lambs to be turned out. We had 100,000 acres of land, most of it in clover. Now, as soon as a sheep got into it, you could tell where he stood.

Now, when you turn them out you may have some trouble about intestinal parasites. That time comes along about the middle of June. Then the ewes go out to grass with the lambs, and I tell you it is a pretty sight to see those lambs run up and down the fields, and play, and then run up to the ewe, and off again, as if asking her to watch them at play.

Make a place on the ground and spread a little corn meal there for them, and one of the best things you can give them is coarse salt that you buy, and then, of course, there is the mother's milk—the best of all for them.

The winter lamb business is conducted in the same way. Begin early, and when the lambs weigh eighty pounds they may be sold. I would not keep them any longer, because then the Western market comes in and the prices go down. I would try to have them ready for market in June and July. How are you going to do that? It is easy if you have the alfalfa to raise them on. Then with the returns from the lambs, and the old sheep left to fertilize the land, our returns will come in, and the dollars will flow into our bank like cherries.

THE RELATION OF VETERINARY EDUCATION TO ANIMAL HUSBANDRY.

By DR. LEONARD PEARSON, *State Veterinarian, Harrisburg.*

The fertility of the soil, and an advancing profitable agriculture, cannot be maintained without animals. Animal husbandry is essential to agricultural progress.

The animal husbandry of Pennsylvania is one of the leading industries of the state, and is the chief reliance of a large proportion of the farmers that work the quarter of a million farms within our borders. The farmer depends upon animals to till his fields, to take his products to market and his family to church, to supply his most nutritious food and a large proportion of his income.

What value would there be in a \$55,000,000 hay crop, (these figures relate to the crops of Pennsylvania for 1905) as under present conditions, if it were not for animals to eat it? What would be done with straw from 1,600,000 acres of wheat, and with a \$15,000,000 oat crop were it not for animals? About 1,500,000 acres is devoted each year to the production of corn, worth about \$30,000,000, most of which is fed to animals on the farms where it is grown.

The rough, bulky, unmarketable products of the farm are concentrated by animals and converted into such commodities as pork, beef, mutton, wool, poultry, eggs, milk and horses for which there is a ready market. Just as the weaver uses the loom to transform his raw materials into carpets, cloth and lace, so the farmer uses animals to manufacture grass and other crude products of his fields into refined and higher priced articles.

The profits of farming depend to a very large extent upon the efficiency of the farmer's machines, both mechanical and animals. If the animals do good work, that is, if they return a good yield in the form of growth, eggs, milk, wool or labor for the food they consume, they are profitable; if they do not return a fair yield of these products, they are unprofitable. The efficiency, and that means the profit of the animal machine, depends upon its adaption to its condition of life, and upon its adaptation to its conditions of life and upon its health. The adaptation of domestic animals to special uses results from the work of the special breeder. Breeders have achieved some marvelous triumphs in the way of increasing efficiency and in producing and fixing form, type and breeds.

We are profoundly impressed when viewing a well executed statue by the imagination and skill of the artist. The sculptor forms in his mind a picture of the image that he wishes to express; then the image is modeled in clay and afterwards chiseled from stone or cast in bronze. The result is a likeness of a living form; it may be a charger, with ears and eyes alert, with dilated nostrils, tense muscles, the whole poise denoting readiness to respond to the touch of the motionless rider. Such a life-like picture in bronze is a

great work of art, a triumph of human skill and ingenuity. But how much greater is the achievement of a breeder of an improved animal type! The sculptor must be faithful to nature and copy a figure that already exists. The breeder forms in his mind the picture of an ideal animal, as yet unrealized; his plastic material is living tissue; his materials, if combined with genius, and surpassing patience, produce an animal of a new form and having new attributes. He has created something, not merely a picture, that is good to look upon, but a living, breathing, moving animal, that is better for a certain purpose than any animal that was ever produced before, and that, most important of all, has the power to reproduce its kind. Improvements in animal types, and much of the improvement in the efficiency of animals have been wrought by these rare, skillful breeders.

The breeder does not work rapidly; the element of time is needful in all of his operations. His material can be changed and modeled but slowly. It was largely on this account that the work of the breeders was relatively so fruitless until a little more than one hundred years ago. The breeder was denied the use of the indispensable element of time. After making a certain amount of progress, his material was damaged, or it was snatched from him by infectious disease. Nearly all of the great improvements in the breeds of animals have developed since the establishment of veterinary schools, and since animal plagues have been brought under some kind of control.

There was less difficulty on account of its isolated location in protecting the cattle of Great Britain from animal plagues than was experienced in Continental Europe. This is one of the important reasons why distinct, improved breeds of animals were established in Britain before they were established in other parts of the civilized world. Of course, the freedom of England from invasion by armed foes was an advantage to the breeder that also came from this isolated location; but in all times animal plagues have destroyed more animals and have damaged breeders, more than wars and famines, because they have spread faster, and wider, and oftener, and because no opposition could be made to their progress and ravages. The losses that come from the prevalence of such diseases are well illustrated by the effects of contagious pleuro-pneumonia, foot-and-mouth disease, and cattle plague, when through neglect of veterinary advice they did reach England and prevailed during the second third of the last century. It is estimated by Fleming and others that the actual value of the cattle destroyed by these diseases exceeds \$600,000,000. (Fleming's estimate made in 1871 of \$450,000,000 was for only a part of the period of the prevalence of lung plague and foot-and-mouth disease.) And Fleming adds, "But these examples and estimates after all give but a slender idea of the devastation, misery, embarrassment and loss that have been due to our ignorance, apathy and neglect of the teachings of veterinary and sanitary science, which must nevertheless claim the merit of having conclusively demonstrated that the most formidable diseases can be readily repressed or altogether abolished."

It has been possible to develop the Jersey and Guernsey breeds because the cattle of these islands have been protected from infec-

tions from abroad through regulations prohibiting the importation of live animals. Of course, this prohibition has at the same time, been of service in helping to keep the breeds pure, but the chief advantage of these regulations has come from preventing the entrance of animal plagues. The older breeds of the continent, as the Simethal, Dutch, Brown Swiss and Normandy cattle, Merino sheep, Ardenner and Pinzgauer horses have developed in more or less sequestered localities where they have been to a large extent exempt from prevalent plagues.

Improvements in breeding come, then, from continuous effort; and continuity of effort is an absolutely essential factor in breeding advancement. In this country we have lacked more than anything else, continuity of effort. How frequently has it happened that a man has gathered together at enormous cost the best purchasable representatives of a breed. The stud, herd, or flock is thus established if continued in competent hands for a number of years could not fail to be of enormous advantage to that particular breed. Unfortunately, however, such enterprises are often—I think I might say usually—short-lived.

In looking for the causes that are responsible for the melting away of these promising beginnings, I have found that disease is the chiefest. Let me illustrate: About twenty years ago, a considerable number of large poultry farms were established in the eastern part of Pennsylvania, in New Jersey, and other parts of the Eastern states. Many of these establishments were carried on successfully for a few years, and the outlook for continued success appeared to be very promising. None of these establishments is now in existence. I do not know of a large commercial poultry plant that is as much as ten years old. In nearly every instance, the reason given for the discontinuance of the business is that it became unprofitable on account of the prevalence of parasites and disease; the fowls died. When one considers the magnitude of the poultry industry, that the poultry yards of the United States produce more than the wheat fields, the extent of the loss from disease of poultry will be appreciated.

Innumerable ventures in swine breeding and in swine feeding have been ruined by disease. The keeping of hogs has been discontinued temporarily in many districts by reason of disease, very much to the detriment of the farmers in those regions, for there is nothing that can take the place in farm economy that is held by the hog. It is quite out of the question to attempt to fatten hogs purchased at a considerable distance and shipped on the railway. To ship hogs in stock cars and through stockyards is almost certainly to expose them to cholera, and can not be done, in a business way, except in case of hogs that are at once to be slaughtered. This fact is a severe check on the swine industry, although it is not always recognized as such. It was an Iowa farmer who said: "It is a good thing that cholera takes away ten million to forty million dollars' worth of hogs every year; if it did not, the price of hogs would be much lower than it is." It would be as reasonable to desire to keep up rents in a city by burning down a few hundred houses every year.

The parasitic diseases of sheep constitute such an intolerable

drain on the sheep industry in some localities that sheep keeping has been discontinued, even in the face of rising market for mutton and wool.

I have known several promising horse breeding ventures, started with good judgment in the selection of foundation stock, and at great cost to be ruined by the prevalence of abortion, navel-ill, osteoperosis and contagious pneumonia of foals.

An enormous number of herds of purebred cattle have been destroyed or scattered by infectious diseases, particularly by tuberculosis, abortion, calf cholera and contagious garget. I am familiar with the history in detail of a large number of herds in the Eastern states that were carefully organized, and that were of great promise until they were extinguished, or until the enthusiasm of their owners was extinguished by reason of the excessive prevalence of some infectious disease.

It is not alone the rich owner of high bred animals who is injured and discouraged by these maladies. Nothing can be more disheartening, or in a business way, more injurious to a farmer who has a large share of his means invested in animals than to witness the insidious effects of disease, and the gradual depletion of his capital. Such men usually depend for their livelihood upon their flocks and herds. If these are impaired, they are unable to meet rental or interest charges, and innumerable farmers have in this way been carried into bankruptcy.

The average farmer is not, and is not likely to become, a breeder of pure-bred animals. Better breeding to the average stock-keeper, means the elimination of the unfit and the purchase and use of occasional improved individuals, especially males, from the breeders of pedigree animals. The better the quality of such animals, the more moderate the price, and the less the danger attendant upon the introduction of such animals into the herd, the more the average stockkeeper will be encouraged to use them, and the more he will grade up his stock. If pure-bred animals of good stock are difficult to acquire, on account of their scarcity and high price, and if their purchase involves material risk of introducing a new disease the use of such animals is bound to be restricted, and the betterment of the average quality of livestock of the country will be impeded.

One must admit that pure-bred animals of good quality are neither as extensively produced nor as widely disseminated in this country as is desirable. This is due partly to the lack of appreciation of advantages from better blood, partly to prejudice, partly to fear of disease and partly to the fact that there is such a limited number of successful breeders of pure-bred animals, and so many instances of men who have tried to breed pure-bred animals and failed, that there is a lack of sufficient number of inspiring examples. As I have shown a large proportion of these causes of failure trace back to disaster and discouragement from disease.

A hundred and fifty years ago it became evident to Bourgelat that there was need of careful study and teaching concerning the diseases of animals. The French veterinary schools were established upon his initiative, and this example was soon followed by all the progressive countries of Europe. It was recognized that before there can be an improved agriculture there must be an en-

couragement of animal husbandry, and that the first step toward the encouragement of animal husbandry must be the protection of animals from avoidable disease. Thus it is that in the old world the veterinary colleges antedate the agricultural colleges, and it is for the same reason that the word "veterinary" has priority, for example, in the name of the Royal Veterinary and Agricultural College of Denmark.

The prevalent and most destructive diseases of animals when these veterinary schools were instituted were the very rapidly spreading, quickly developing, and in many instances highly fatal maladies, such as rinderpest, foot-and-mouth disease, contagious pleuro-pneumonia, anthrax, glanders and sheep pox. Some of these diseases from the suddenness of their onset, and their high mortality may properly be designated as explosive. Within a short time one of them may spread over a district and involve a large part of the animal population. All of these diseases have been brought under control by the application of knowledge developed by veterinarians, and taught in veterinary schools. Although occasional outbreaks of some of them still occur in civilized countries, none of these diseases prevails extensively at this time, except in remote, partly civilized regions or in restricted areas in civilized countries, and then usually for only a relatively short period.

The gain from this advance is immeasurable, as is shown by the fearful destruction wrought within limited areas by pleuro-pneumonia and foot-and-mouth disease during their occurrence in this country. Pause for a moment and try to estimate the condition that would exist here if these diseases had been permitted to escape beyond veterinary control. In the first place, our export trade in live cattle would immediately have been extinguished. Second, it would be absolutely impossible to keep cattle on the open ranges, as is shown by the destruction of the cattle industry of Australia by contagious pleuro-pneumonia, a fact which forced Australia into sheep production. Third, the purchaser of cattle from a distance would be exposed to dangers similar to those that now encompass the men who purchase hogs that have been shipped through public stockyards. Every one who purchased a steer for feeding, or a milch cow to add to his dairy herd would take the risk, which in many cases would be realized of infecting his herd with a destructive disease. In other words the whole character of the cattle business of the country would be changed. The loss to the nation would be as great as from a war with a great power, and to cattle owners it would be unbearable. Fortunately, these diseases were not permitted to escape from control, and by the application of intelligent veterinary measures they have been completely extirpated. The veterinary profession does not receive from animal husbandry the credit for this achievement that it deserved.

As two other illustrations of advantage to animal husbandry from the application of discoveries in veterinary medicine, I will refer to Texas fever and "milk fever."

Texas fever is a disease caused by a minute animal parasite that inhabits the red blood corpuscles of cattle. This parasite is carried from animal to animal by the Texas cattle tick. In the early history of the country this disease was each year distributed widely in the

Northern states by the introduction of Southern cattle. The nature and cause of this disease were discovered in 1889. Measures were at once taken to prevent the infection of Northern cattle, and with such success that Texas fever formerly so prevalent is now almost unknown in the Northern states. Moreover, measures have been devised for the protection of Northern cattle taken South with such success that great numbers of breeding animals have been taken to Texas and other Southern states with the result that the Texas long-horn has been practically bred out of existence and Texas bred steers are now of such good quality that many of them have taken high prizes at the great stock shows in Chicago. Measures are now being taken—measures that have been developed by veterinarians—to exterminate the cattle tick in invested portions of the country. This work has been carried out successfully in some large districts, and, although the fight will be a long one, there is no reason to doubt that it will ultimately result in the eradication of this bovine scourge. The benefits that result from the measures already taken amount to untold millions, and it is estimated by Meyer that when this source of disease is finally extinguished the country will be better off to the extent of \$100,000,000 each year. Then the South will become a great breeding ground for supplying feeders to the corn-growing states.

The other disease that I shall refer to is the so-called "milk-fever," parturient paresis or "dropping-after-calving." This disease has long been one of the principal destroyers of dairy cows of the first class. It is a disease that is most likely to take cows that are heavy milkers and while they are in the prime of life. It has had two especially untoward results: First, it has destroyed many, indeed, a large proportion of the most highly developed and most valuable dairy cows, and thus has prevented further increase in the produce of these exceptionally useful cows. Second, milk fever has seemed to establish a barrier to the evolution of the milch cow, as it has destroyed so large a proportion of the cows that reach or pass a given standard yield. In some good dairy herds the average mortality from milk fever was for many years higher than from all other diseases. By means of a simple treatment discovered by Schmidt, a Danish veterinarian, it is now possible to cure from 90 to 95 per cent. of all animals suffering from this disease. The gain to the dairy industry from this discovery is almost beyond belief. It amounts to at least a million dollars a year in each of the leading dairy states of this country, and the saving and profit is sufficient to pay the interest on the entire bonded indebtedness of the Pennsylvania railroad. Surely this discovery constitutes an enormous addition to our national wealth. The saving to the country is equivalent to a discovery of a new source of wealth, equal to an income producing investment of more than \$150,000,000. This discovery has already saved to cattle breeders more money than has ever been paid on building, equipping, and maintaining all the veterinary schools of the world since the establishment of the first one in France in 1762. For this valuable discovery Schmidt has received several resolutions of thanks, and his Danish colleagues have presented him with a loving cup! While the full credit for this discovery must go to Schmidt, it should not be overlooked that

it was based upon knowledge of milk fever that had been gradually accumulated by veterinarians through a long term of years. So, strictly speaking, the discovery belongs to the veterinary profession, as indeed, must practically all the discoveries in the veterinary sciences.

In giving these illustrations of the value of veterinary research and veterinary teaching, I have tried by concrete example to demonstrate the intimate, although not always recognized reliance of animal husbandry on veterinary protection. I have tried to show that animals would not be as well bred and as efficient as they are were it not for the measure of veterinary protection that has been afforded; and I have endeavored, also to make it clear that animal husbandry would advance faster through improving the quality of animals by the encouragement of better breeding if a fuller measure of veterinary protection were provided. I have made a careful study of this question and I am sure that I am not overstating the case in the least degree when I say that the greatest need of animal husbandry in the United States at this time is Better Facilities For Veterinary Research and Education.

Other countries have recognized these needs and have taken effective measures to meet them. The old veterinary school at Hanover has recently been re-equipped at a cost exceeding 3,000,000 marks. The public has demanded this, and the government has willingly complied with this demand for no other reason than that the value of the work of the school is such as to merit the expenditure. For a similar reason Belgium has re-equipped the old veterinary school at Brussels at a cost of 6,000,000 francs. Hungary has provided a magnificent set of buildings for the veterinary college at Budapest, where all branches of veterinary work are provided for. The government veterinary schools of Germany, France, Austria, Hungary, Russia, Spain, Denmark, Belgium, Holland and Sweden are supported on a liberal scale, first, because these countries recognize their need of veterinary development, and, second, because the value of these schools is such as to fully justify the expenditures that are made upon them, and the provision of increased resources, as needed for their growing work. Either of the two veterinary schools of Switzerland is better equipped, and proportionately more adequately supported than the best veterinary schools in the United States.

The honor of making the first proposal for promoting veterinary science and instruction in America belongs to the Philadelphia Society for Promoting Agriculture. A prize of a gold medal was offered in 1806 for the best essay and plan for promoting such knowledge, both scientifically and practically. The announcement states that aid to schools and establishments for this, among other agriculture purposes ought to be given by the national and state legislators, and adds;

"Investigations into anatomy, diseases and remedies for the preservation and improvement of animals on which our substance and comforts so materially depend must assuredly be considered worthy the most patient inquiry, intelligent observation and professional talents of the most celebrated among those who have devoted themselves to medical pursuits. As patriots it should stimulate their

public spirit; as professional men nothing can more entitle them to the rewards due to their labors. Who is there among the most respectable of our own citizens, or in the highest grades of society in the Old World, who has not deemed it meritorious to promote the interest of agriculture? And is there any branch of that occupation so important as that now recommended to the notice and inquiry of medical men? If it has held an inferior rank in the classification of science and knowledge it is entirely owing to the unmerited neglect with which it has been unaccountably treated. It should be rescued from obscurity and placed among the most commendable and necessary branches of medical education."

During the following year, 1807, just a century ago, an address was delivered at the University of Pennsylvania by Dr. Benjamin Rush upon the duties and advantages of studying the diseases of domestic animals and the proper remedies to relieve them. Dr. Rush formulated under nine headings and for the first time in America, a series of powerful arguments in favor of developing studies of the diseases of animals.

It was not, however, until 1884 that the Veterinary Department of the University of Pennsylvania was established. For twenty-three years this school has taken a leading place among the veterinary institutions of the United States. It has educated 374 veterinarians who have taken the full course and have received its degree. It has now enrolled 111 students. In this body there is a considerable number of earnest young men from the farms of Pennsylvania, who are working hard to obtain their training in this fundamental knowledge underlying animal husbandry, and who plan to return to rural districts and apply the knowledge thus gained for the relief and advantage of agriculture.

The maintenance of the Veterinary School has thus far been provided by the generosity of a few philanthropic persons who have recognized the importance of its work, and by the loyalty and devotion of its teachers. The extent of the services that have been given gratuitously by members of the teaching staff of this school for a period of nearly a quarter of a century is most unusual. If they have succeeded with the assistance of their public spirited and generous friends in placing veterinary education in Pennsylvania on a sound and enduring basis, I am sure that they will be satisfied. And it begins to look as though they are succeeding, for the legislature at its last session appropriated \$100,000 towards furnishing part of the equipment that the school urgently requires. But this provides for only a portion of its work, and some of its most important branches must still be taught in wholly inadequate, unsanitary premises. It is still unable to do for the State, work that the State urgently needs.

There is coming to be more general appreciation on the part of breeders of veterinary work of what it has done for them, and of the importance of the objects veterinarians are striving to attain.

There are several reasons for the slow development of this appreciation in this country. Perhaps the veterinarian has not been sufficiently insistent on the achievements of his profession and the value of his services: undoubtedly the schools have not been adequately equipped, and they have not been able fully to meet the

very moderate requirements that have been placed on them, so that the graduates of these schools have been handicapped in their efforts to aid animal husbandry. Furthermore, public support that might fairly be expected for this important branch of education has in some states—not in Pennsylvania—been diverted from veterinary schools, where it properly belongs, and where it should go, to weak and ineffective veterinary appendages to agricultural colleges or experimental stations.

It is the aim and purpose of the Veterinary Department of the University of Pennsylvania to make available and to distribute the information that is needed to afford animal husbandry the veterinary protection it requires for its development and expansion. It can do this by training and sending out educated, capable veterinarians prepared to cope with the ever-increasing problems in animal physiology and pathology that perplex and discourage the breeder. But the school needs help, and, while I do not doubt that it may confidently rely on your sympathy, I hope that it may also receive your active assistance.

HOW TO GROW ALFALFA.

By JOSEPH E. WING. *Mechanicsburg, Ohio.*

I need a little courage to stand here and talk to you about alfalfa, coming from another state, with a different soil, and sometimes when I have gone away from home to show how to do it I have failed. Now, here is Prof. Van Norman; I went up to the University of Wisconsin for two weeks urging him to get married, and here I find him in the same condition. (Mr Bayard: That is his misfortune; not his fault.) If I failed so badly on so small a man, how can I hope to move so large a body of men as these farmers? But when I looked at this good looking body of men—not necessarily handsome, but intelligent looking—I said to myself, "There is no doubt but what they can grow it."

Henry Miller, a butcher's boy, went to California and landed at San Francisco with fifty cents in his pocket (he has that fifty cents yet). He did not, as most men did who went to California at that time, go into mining, but he went into a butcher shop and saved his money until he had enough to buy a basket and stock it with meat. This he arranged neatly and cleanly, and then peddled his meat from door to door, and saved his money. When he had established a nice trade he opened a little shop, where he kept his meats just as temptingly arranged. Here, too, he saved his money, and then opened another shop, and then another, and another, until he had a dozen shops scattered over the city, and became the leading butcher. Still he saved his money, and then he bought a farm out in the San Joaquin Valley, a few miles out from San Francisco, and there he sowed the first alfalfa that was ever grown in California in a large way, and that was not very large either. I think it was about forty acres,

and it cost him about forty dollars an acre, too. It cost him a lot because he did not understand about inoculation. He had seen the alfalfa in South America, while sailing to San Francisco. Then he got more seed and tried again and failed and then he sent to South America for seed, and tried it again and by that time the soil was inoculated, and he succeeded. Then he got more land, then more cattle, then more land, until he has become a rich man; but I can't stop to tell you of the 100,000 head of cattle that Henry Miller has, all because he planted alfalfa.

I went west in 1876, not intending to farm it, but intending perhaps to be president, or maybe governor at least, or something of that kind, but the first thing I knew I found myself working on a cattle ranch in Utah. We had no alfalfa there then, and not for a few years afterwards, unless it happened to grow there. I think I brought it to that ranch first. But before I went there, I was in Salt Lake City, and walking up street one day I saw a load of green hay, and I stopped and looked at it, and wondered what it was, it was so nice and green. I went over and looked at it, and it smelled just as nice as it looked. So I tasted it, and I said to myself, "It is good." Taste it, gentlemen, and see for yourselves, and if it is not good I will give you some more. My rule is to taste the feed I give my animals, and if it does not taste good for me, it will not taste good for them. I said, "That hay is all right and if I don't get work for awhile, I can always go out and buy a load of this hay and live on that till I get something to do."

Well, after awhile we got some alfalfa, and tried it on the ranch, and the cattle chewed it like a hired man chewing tobacco, and they maintained their flesh on it all winter, and thrived on it in summer, and before long we were feeding all our animals on it. And all the time I was dreaming of my father's little old farm of 196 acres down in Ohio. It was not very much of a farm, and it was not very profitable, but I loved it; it was my home; and nights and some days I would lie dreaming of it, and the old folks—a place so different from that big ranch. And after awhile I began to wonder whether alfalfa would not grow there, and I sent my father about a pound of seed, and he sowed it. After a while I went back home on a little visit, and as soon as I had seen my father and mother, and my sweetheart, I wanted to see that alfalfa. I asked father where it was, and he told me it was out behind the barn, but he told me it was no good; it might do in the West, but it would not do here. So I went out and looked at it, and it was only about six inches high. Father said, "You see I am right; it may do in the West, but it will not grow here." But I began to hang round; that is a way I have—to hang round until I either succeed or know why I don't. I am not sure that is a bad trait, either. Well, pretty soon I saw the chickens come round there and pick at it, and I said to myself, "Ah, now I see why it don't grow any higher." Then I began to think that what it needed was irrigation, so I carried some water from the well, and watered that little patch, and then I took an old barrel which had one end in, and knocked the other end in, too, and set it over that alfalfa to see what it would do if given a chance, and went off to see my sweetheart, and forgot all about it for a while. When I thought of it again, and went to look at it, it had grown up through the top of that barrel. I called father and showed it to him; he scratched

his head, and said, "Do you suppose I want to grow a crop that I have to put a barrel over?" But I said to myself, "If that one plant will grow, why won't a million?"

Well, it was not many years before I was called upon to go home and take charge of the place. I didn't like to go, for I had been given some authority out on the ranch, and it makes a young fellow feel pretty important to be made foreman. I had to get up first in the morning and get the bricks with which to get the other fellows out of bed, as you do when you are foreman; the only difference is that you have to work a little harder, and get a little more. But my father was old and could not do the work any more, and so I had to go home. "Well," I said, "I will go home, and see whether I can't make a success of the old farm," I could see alfalfa, but nothing else, and when I came home from the West I brought with me seven sacks of alfalfa seed. But father said we could not afford to experiment, and we must sell that seed. Finally we compromised on a quarter of an acre and I had seven sacks of seed! And I had an awful time selling that seed. I could not give it away; the neighbors would not have it. I could not sell it; the seedsmen would not buy it. I advertised it, but it did not want to move. Finally I did manage to get rid of it by selling it in small quantities; now, some of the same seedsmen sell \$30,000 worth of the seed in a season.

Well, that old potato patch was rich; the cattle had pastured there; the soil had been enriched by a corn crop, and I sowed my alfalfa and it grew. The next spring I sowed three acres; I picked out what I thought was the best land I had for the purpose; it sloped down toward the creek; a part of it was gravelly soil, and a part of it hard clay. Well, down by the creek the alfalfa did not do so well; on the gravelly soil it grew. And I scratched my head and said, "This old farm will grow alfalfa; I must manure the hard land and drain that wet land, and then it will grow alfalfa." Father had died in the meantime, and my brothers and I were running the farm, and we began to lay tile underdrains, until finally on that farm we had laid more than 14 miles of tile underdrains, and all the time we were feeding the stock in order to make manure to enrich the soil. During those years I was not trying to make money. I did not give it any thought. My brother Willis gave it some little more thought than I did, and perhaps it is just as well, as we might not have fared so well if he had not. I only thought to grow alfalfa, and I said, "I will have forty acres of it, some day." I have a hundred now.

I found we needed more manure, and I said, "I will buy lambs, and feed 200 of them, and sell the lambs in the spring, and make some money on them, and keep the ewes to enrich the soil." My brother said, "You must be crazy; do you want to run the farm into the ground?" But I got the lambs. First we had 200 lambs, then 300, then we fed 350, and we always had feed enough for them, and the farm grew fertile; it is the most beautiful thing in the world to raise lambs, and I said to myself, "Some day I will have on this old farm 1,000 lambs." I did not tell my mother, or my wife, or any one else, but I dreamed of my thousand lambs. Well we got seven hundred—a thousand—fifteen hundred, and now we have sixteen hundred sheep on that farm, and are shipping alfalfa to the Philadelphia market. How do we do it?

Well, our soil was limestone, and I hauled manure on it until I got it pretty rich, and then I sowed alfalfa. I had not much faith that it would grow, but it did grow. That was in 18— well, never mind the date. Well, I gathered alfalfa three times a year, and sometimes four times, for five years, and by that time it had died out some and we planted corn. Now, before we had the alfalfa about 30 bushels of corn was a fairly good crop; even after we had drained it, 50 bushels was a good crop, and if we got 65 bushels of shelled corn to the acre, it was a remarkable yield. After we had the alfalfa we made 80 bushels of shelled corn—twice the quantity—and—I can assure you of fields where we made 100 bushels of shelled corn to the acre. The more alfalfa we grow, the better crop of corn we grew, and the more corn we got, the better crop of alfalfa. That was because the soil had become inoculated, and the bacteria are living there now. Last year we grew on our farm 300 tons of alfalfa, and we expect to grow 400 tons this year. That old farm has now 320 acres, and on that farm we harvested last year more than 7,000 bushels of corn of 75 pounds to the bushel, and 300 tons of alfalfa hay, and we save some of the land for pasture for our sheep, and for the cattle, and some good Percheron horses we have.

These alfalfa roots get down into the bottom of the soil, where it has been planted for a year or two years. The plant is a heavy feeder on nitrogen in the air, and at the same time you grow alfalfa, you enrich the soil. Now, what Prof. Hopkins said this afternoon is true. Alfalfa needs phosphorus, and last year we put on our farm from 200 pounds to 400 pounds to the acre, and actually doubled our crop, and we got \$14 worth of crop for every dollar's worth of phosphorus we put on the soil.

This is what alfalfa has done for one farm. Don't you think I believe in it? When I started in in 1889, one old darkey and my father were sufficient to do all the work. Now on that farm my brothers work the year round, and I work when I am home—and my brothers are good workers—and we have three married men working every day in the year, and we have a number of single men there, too, and I am glad to give them employment, because the more good people you get into your neighborhood the better your neighborhood. I walk out through the corn fields, and I see where a man has thrown back a clod of ground away from the corn, or where he has straightened the stalks, and I know what that man is. These things show faithfulness in a man, and these are the sort of men to have around you—people who take an interest in their work, and their surroundings. These men live there, and their little boys go to the village school with my boys, and their dinner pails are packed with the same food my boys have—they are filled with alfalfa.

Why, it is just as easy to grow alfalfa as it is to keep your sweetheart or your wife in love with you. If you know, I don't need to explain it to you. If you don't, I will say that I have never found it requires any superior talent. She does not expect you to climb the roof of the house, or to do any great thing, but she does expect of you the little things that show your affection for her, and your thoughtfulness for her.

Now, if you will get into your minds a few things that alfalfa demands, I think I can help you get your farm started in growing al-

falfa successfully. What are these few things absolutely necessary?

First, the land must be absolutely dry. Dig holes in it, and inspect them, and see if they fill up in wet weather. If they do drain it with tiles. Just lay your tiles as close together as you can, and then let them go. Then take your manure spreader and give that field a thorough coat of manure and turn it over thoroughly.

Let me tell you another thing: It is a surprising thing, I know, but it holds out. If, in plowing, you notice the blackbirds follow that furrow, alfalfa will grow there. The blackbirds follow the earth-worms, and where the ground is too poor to produce earth-worms it is too poor and too hard for alfalfa.

Your land drained, you must make it rich. Now alfalfa is the greatest soil enricher that I know of, but it will not enrich poor soil. That is, according to scripture, which takes from him that hath not, and gives to him that hath.

Down in Kentucky I planted more than a thousand little plots in the course of my work there. Some time ago I passed through that State, and as I sat in the train and looked out of the window, as the train wound around the curves of the mountains, perched up on the mountain side I saw a little cabin, and a young woman in a sunbonnet in the field near it. And I said to myself, "There is loneliness and privation." There is an old bone-grilled tobacco field or two, with some sassafras brush—just enough to keep life in that young man who has started up housekeeping with that young woman in the sunbonnet, and that old mule—and then the train went round the curve, and right there on the top of the ledge lay a little field of alfalfa, and then my heart was glad, for I saw better days ahead for that young couple. That alfalfa will enrich that old mountain soil, and he will have crops to take to town, and they will have comfort.

Now, I don't know anything that will enrich a soil quicker than alfalfa will, but you must give it rich land to start on. What do I mean by rich land? I would make it as rich, almost, as I would for a corn crop. Take off the corn crop, if you want, and then start right in on alfalfa. Another thing is, it must be grown on sweet land. More of the failures to grow alfalfa in Pennsylvania have been due to lack of lime in the land than to anything else. About a year ago I was looking at some land down near Philadelphia. The land was rich, it was dry, but the alfalfa would not grow. It was lacking in lime; the soil was acid. You can put the lime there and make it sweet. The Experiment Station has not found it so, but they may be wrong, for I believe in the lime.

Now, these things are all you need. The land must be dry; the land must be rich, and the land must be sweet. The rest of it is just faith.

Then, how are you going to sow it? Let me tell you how we sow it. We sow it always in the spring, and we try to cultivate the crop of the previous year. In our corn crop we run a one-horse cultivator through it to rid it of the weeds, and it is important to get rid of the weeds early, before they spread and take a firm hold. When we have turned the soil, we work the lime in, and we get the seed up by the middle of April, and we sow it always with a nurse crop of beardless spring barley. The seed is a little hard to get, but it is the best barley to sow, and it is wise to sow your alfalfa with

a nurse crop of barley. It grows quickly and does not leave any stubble. Well, we sow a bushel to the acre, and a peck of alfalfa—15 pounds of alfalfa to a bushel of barley. When we harvest the barley we will cut the alfalfa down as far as it will go, and then we let it grow again. Now as long as the alfalfa will grow the first summer we let it grow. There will come a time when it will look thrifty, and then get down on your knees right there on that alfalfa ground, and see if there are any new buds just starting out, and don't cut it until you see the new buds starting. It does not take long for a man to get down on his knees; it is a good thing for him, now and then. Then, when you see the buds starting, you cut it. It will soon grow up again. We never cut it down close to the ground; we always leave about one-half of it, and we do not allow a wagon to pass over it, nor a horse.

Now, I have told you everything I know about alfalfa, except one thing, and that is, it will not grow without bacteria. Cream will not sour without bacteria. When I was out on the ranch, we used a great deal of clabber, and it made the men feel like fighting cocks most of the time. I have no doubt that it was those fighting microbes that did it. But to grow alfalfa the ground must be inoculated. If your ground is inoculated, you will get a crop the first year; if it is not inoculated you will not get your crop until the second year.

And while you are waiting for your ground to become inoculated the weeds come, so send to Washington and get some of the bacteria. Some of these bacteria will be all right, and some of them will have been living on their wife's relatives. Then I would take some of the soil of the old alfalfa field, and some new soil, and I would sow these bacteria, and harrow the ground in the evening, after sunset, and all the rest is just faith.

Don't start in on a large scale. Try it with one acre, and when you have found which is the best land, you can try it with two acres, and then you can gradually increase your alfalfa crop. It is the best thing in the world for chickens, and for cows, for sheep and for colts. It is the best thing I have yet found to grow on the farm.

A PROFITABLE METHOD OF MARKETING MILK.

By J. H. REICHERT.

There are many farmers and dairymen keeping cows at little or no profit because the price they receive for their milk is entirely too low when compared with the present trust prices for grain and labor difficulties. The key to the situation then is, of course, a better market, or better prices for our milk. In most cases, before this market and price can be secured we must arrange for more modern methods on the farm for the production of clean wholesome milk from healthy cows. Some of the things necessary are: Your barn must have some method of ventilation; no matter how old the barn, the

man who reads (and no farmer or dairyman should be without four or five of the best agricultural and dairy papers), can devise some plan to do this at small cost. The barn should be whitewashed every 60 days at least, the barn and cows must be kept reasonably clean, the cows should be tested annually for tuberculosis, not only as an aid to a better price of milk, but as a matter of self-protection. The udders of the cows should be wiped with a damp cloth before each milking. The milk should be removed from the barn, and cooled as soon as a cow is milked, if possible, and kept very cold—say 45 degrees—until shipping time. I know that there are many farmers anxious to follow better methods but are restrained from doing so because of the expense connected, and a feeling that they cannot procure a sufficient increase in the price of milk for the trouble and expense involved. In answer to the matter of expense, I would say, that with a proper system of doing this extra work, the expense of caring for cattle and barn in a reasonable, sanitary manner, need be but a trifle larger than the cost of doing so in the ordinary slipshod way.

At Willow Glen Farm, we seem to have a fairly good system of ventilation for a 100-year-old barn. We keep the cows clean and whitewash the barns once a month in summer and every 60 days in winter, with a spraying outfit; this is done by the regular farm help in less than one-half day. At milking time we have a bucket and cloth back of each row of cows, so that the udders can be wiped before milking. I am sure this adds no cost, but makes the milking more pleasant because the udders are clean. I have never seen the milker who did not become disgusted with a dirty udder. I know of no class of people who are slower to respond to progressive methods than my own, the Pennsylvania Dutch, yet these people follow the weighing of the milk, and the wiping of the udders religiously, because they see the value of it. It is plain to be seen that with me it adds but little, if anything, to the cost of production, but adds considerably to the value and wholesomeness of our milk and gives us a ready market at one cent a quart above the regular price. Let us see how this would figure out in a 5000-pound cow. Five thousand pounds of milk would give us approximately 2,390 quarts.

2,390 quarts at 4c	\$ 95.60
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2,390 quarts at 5c	119.50
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or an increase of \$23.90 per cow for clean milk. In a 20-cow dairy, the difference would amount to \$478 annually.

I appreciate the fact that so long as the farmer leaves himself entirely in the hands of the middlemen, he must take the price offered, regardless of quality. There is, however, in every community, a ready and growing demand for better milk for which at least two cents above the average price can be secured, and milk produced in the manner described is worth all, and more, than the additional two cents a quart that is asked, and people will welcome an opportunity to get such a product if the farmer can bring the superiority of his product to their attention. After having made arrangements to follow reasonable sanitary precautions at Willow Glen Farm in the production of our milk, I went to two nearby cities and saw the retailers and explained the kind of milk I had to sell, and soon discovered that the retailer was anxious enough to handle such milk

if he could procure it just as cheaply as the "don't care how" produced kind, but absolutely unwilling to sacrifice any of his profit, so long as the public was satisfied, or at least stood for the imposition. I then looked around for a man willing to go into the milk business on a reasonable profit basis. Arrangements were made to place the merits of our milk before the people, a nice descriptive circular, with a mailing card and a request to have our man deliver a sample bottle was put into each circular, and these circulars covered the following points:

1st. This milk is produced from a tested herd, absolutely free from tuberculosis.

2nd. A certificate from the local veterinarian who tested the herd, also a statement from him in regard to the sanitary condition of the barn, etc.

3d. An explanation showing the importance of clean milk from healthy cows to babies and invalids.

4th. Instructions to consumers how to take care of milk after it was delivered to them and explaining the danger of allowing milk to become contaminated.

A letter enclosing the circular was also sent to each one of the physicians in town.

Although we did not have a single customer before we started, when we were ready to deliver we had orders for 150 quarts daily, and at the end of 30 days we had sale for all we had at that time, 200 quarts daily. We have received for our milk five cents per quart delivered at the station. This milk was retailed at eight cents a quart—two cents higher than the average price for milk.

In a town where ordinary milk sells for eight cents, ten cents can easily be procured for milk of this quality. In other words, in order to market milk at a profit, the farmer must arrange for the production of milk cleaner and better than the average; and second, carry on an advertising campaign to educate people to appreciate good milk and to believe in his particular product. A proper advertising campaign like the above, can be carried out anywhere for a sum not exceeding fifty dollars.

We, as farmers and dairymen, need to learn the value of advertising in order to create independent markets for our products. If a man has something good to sell, he himself must reach the public and create a demand. In this way only can we secure decent treatment and fair consideration from middlemen. The man who builds up a reputation for his own goods can generally dictate his own terms.

An increase of a cent, or a cent and half per quart, is quite an item, and is sufficient to make many dairies that are not now profitable, earn at least a satisfactory dividend for the dairyman or farmer. I believe that work of this kind would stimulate the dairy business in many communities. If we are ever to get better prices for our products, we must teach the public that there is more than one kind of milk. Once people know how to discriminate, there will always be a demand for the better milk and at better prices.

Do not let the fact that you are not close to a town or city discourage you from making an earnest effort to secure for yourself better profits as a producer of dairy products. This will enable you

to surround yourself and family with more of the things that go to make farm life pleasant and helpful to all connected with it. The plan outlined by me, and followed by myself, will enable you to ship milk at a profit if you live four miles from the railroad, and one and three-quarters hours by rail to the town where your milk is to be sold. I mention these distances because I have proved that within these limits, at least, this plan can be carried out in a very satisfactory manner to all concerned, producer, retailer, and consumer. Prepare to produce a good article, and then tell its merits over and over again until the public will believe in its superiority as much as you do yourself.

Now, I shall be glad to answer any questions, and I will say to all of the farmers, I think that if there is one class of people who has the good of life, it is the farmers, and I think a man who understands dairying, is fitted to stand shoulder to shoulder with any class of professional men in the country today. If you have a good article, why not talk about it, and tell its merits, until the people believe in it too? If you do this you will rise to a higher and better level.

CORN GROWING.

By PROF. G. I. CHRISTIE. *Indiana Experiment Station, Lafayette, Ind.*

Mr. Chairman, Ladies and Gentlemen: So many times have I heard speakers in the last few days say they were glad to be here, and congratulate the people of Pennsylvania on being such a good-looking lot of people, that I have come to the conclusion that we are about the only people, and I am glad to be here.

When people rise to the very pinnacle of fame, as some of us think we have done, they usually make their own terms, and when I am asked to make an address, I usually tell them that I have two rules without which I will not speak; the first is, I must have from two to three hours' time in which to tell what I want to say, and the second is, that I will not talk after nine o'clock in the evening. I must break both of these rules tonight, as I want to let you go home, and it is already considerably after nine o'clock.

It seems ridiculous for me to come here and tell some of you people who have grown corn many more years than I have lived, how to grow corn, and I want to say that I do not come here as knowing all about it or to tell you all about it. I simply wish to impress on you tonight the importance of doing some of the things you already know. Our agricultural improvement is coming to the people as nothing new—just as telling you that you need pure food and other things are not new things, but telling them to you impresses their importance upon you.

Prof. Holden has 228,000 farms in Iowa, and he has increased the yield 75,000,000 bushels. We, in Indiana, are simply trying to wake our people up. When I first went to the farmers there, some of the

old gray-bearded men said to me, "That's all right for you fellows in Iowa, but we don't want it here. You can run your corn experiments, and do these things there, but our people are too conservative; our people are not as sensational as they are in the west. Joe Wing, here, who does things with alfalfa, he came here and tried to get us to do them, too, but our people went ahead in the old way and forgot all about it."

Indiana had averaged from 35 to 38 bushels per acre, which was not large. La Porte county on the north, and one of the hardest we have for growing corn, had this year 60,000 acres of land in corn. They had got in some parts an average yield of 38 bushels per acre, and on the hard clay soil they had an average of 32 bushels per acre, and thought they raised their full share. We went up to La Porte county and increased their yield to 50 or 60 bushels per acre, and then they said they were making money, and they saw their land increasing in value, and they were satisfied.

But we wanted to raise the yield in that county, so we decided to get the boys interested. There are several banks in that county and we went to the bankers and induced them to offer prizes to the boys to arouse their interest, and the boys undertook the work, and their yield astonished some of those people. Why, one boy had an average of 114 bushels per acre. Then more boys came, and they raised each one acre of corn on the sand hills, and the clay banks, and the marsh lands of La Porte county, and at the meeting on December 14th, 8,416 boys reported. One boy, in low marsh land that was sold two years before at \$5 per acre, raised 119 bushels of corn of 70 pounds to the bushel. A boy of 18 demonstrated to the people of La Porte county something that they had never attempted before. The president of the school district gave a sworn statement that the average of those boys was over 84 bushels per acre. Well, we needed more money to continue our experiments, and I went up there one morning, and a man interested in the Legislature took me around in his automobile, and within a few hours we had secured all we needed. It is just a little matter of getting what you want. That is all there is about it.

They became interested up there; and then the question came up, "Can we afford to raise beef cattle on 100 acres of land?" and I heard farmers say that they could not raise cattle on 100 acres of land; they needed it all for corn. And once, when I presented this report of La Porte county, one old farmer said, "Could I take care of 40 acres of land the same way that boy took care of his one acre?" I said, "No, sir; cut it in half, and take care of twenty acres, and instead of 35 bushels an acre, you will have 75. Turn the rest into grass, and in a few years that old farm will be worth more than you ever saw before."

The question is how to get more corn off the same land, and the thing is how to do it. That is what you want answered, and that is what we want to answer. The first thing is, to get the variety of corn that is best suited to the soil and locality. Many of us, through ignorance, have allowed our land to run down to the point where it will not produce corn any more, and others have through hard work brought up the standard of corn, but they still lack in production.

Now, these men are here, the same as they are in Indiana, and other States, and these are the men we want to help. We want to find out what will most benefit them. Now, how are we going to find this out?

Now then, a few years ago the men at the Experiment Station got together and decided that they would try to get the corn that averaged the largest yield, and then teach the farmers of the State that this was the corn for them to plant. So the Experiment Station men—I was one of them—sent to the north and to the south, and to the east and to the west of the State, and procured samples of the different varieties of corn grown there, and we planted them in nice little plots, and awaited results. The southern part produced 60 bushels per acre, the north 30, the east 40, another 50, and so on. Then we published these results and sent them over the state, and told them “now you know.” Well, they tried it; and the corn grew; in fact, I think it would be growing yet if the frost had not stopped it. But it did not ripen and develop, and they had to harvest it when the time came, but it was a miserable lot of corn. You may have read that one year the corn crop of Indiana was a failure, and the corn not up to the standard. That was the year. Well, they harvested that corn, and then the troubles began in earnest. The elevator men refused to take that corn; no one would have the stock. Finally they compromised on a lower price, and the corn was shipped away, and one after another of these farmers came to us and said, “We have lost \$1,800 or \$8,000,” as the case might be, “on the corn we shipped out last year, and the only reason for it was that the corn was not fit to be shipped,” and they blamed the Experiment Station—as they had a right to do. One old fellow said that the reason was that those fellows up at Purdue had taken the corn away from home, and tried to get results on different soils, consequently the results they offered were not accurate and had no value, and he was right.

So the last two years we have had a man at work in each section, growing corn. I want to speak of this, because it is of value to the people of Pennsylvania. The best way to obtain results, and determine what is needful for that particular soil is by experiment station right in your own county. For instance, for the farmers of Lancaster county, a station right there doing the work on that particular soil, and awaiting results. Well, this is the way we did it in Indiana.

We have in every county a poor farm, which has never produced anything for anybody, and nobody expected it to do so; in fact, people usually forgot all about it until they came to pay their taxes, and then they grumbled a little at it. So we went to the authorities and got permission to use these poor farms for our work, and then we went to the farmers and asked them to co-operate with us, and in Randolph and Clinton counties, where we carried on this work, we had about a hundred of them interested. In Randolph county, on the 10th day of May, over 20 farmers gathered together, and each one had a sample of the corn he was going to plant that year. Then they each took a plot and planted it under the instructions of our Experimental Station, and they got results that surprised them. They ran from 47 up to 90 bushels per acre, and I sat down and figured

it out for them; by planting No. 1, which averaged 90.3 per acre, the farmer would, on 40 acres have just \$1,900 more than he ever had before. That particular variety would produce the largest yield on that particular soil.

You can do the same thing in Pennsylvania. Take the man in your neighborhood who gets the largest average, and instead of sending out to Indiana or somewhere else for some of this red-letter corn that is being grown there, and which will probably not produce one-half as much on your soil, owing to the difference in soil and climate, go to the farmer in your neighborhood who is getting the best results, and get some seed from him and plant that, and see whether you will not obtain the same results in dollars and cents. -

I want to say right here now that I think Pennsylvania is ready for improvement in corn, and I would like to get your younger men interested. The farmers of Pennsylvania have not figured out exactly the best variety in corn farming. Now, in Ohio, and Indiana, and Iowa, we have Corn Growers' Associations, and they have figured out for the farmer that this is the best variety for him to plant. They have figured out that an ear of corn about 10 inches long, and $7\frac{1}{2}$ inches in circumference is the best sized ear. It will have less cob, and more rows of corn well filled out. Our men, three or four years ago, began to point out to the farmers the difference in the size of the ear of corn. We have found out that an ear of this size will fill up the wagon to better advantage. It will have more rows and will be better filled out all around than the longer ear. We had quite a time convincing these farmers, but we kept at it until we did convince them. I believe that in Pennsylvania you can grow any kind of corn you want. I believe that you are getting away from things when you begin to mark the difference in corn. Now take these two specimens, one about 11 inches long, and the other probably about one-half larger. Now, when these were weighed up, the smaller cob was practically within three-fourths of the weight of the larger. The little one weighed 16.14 pounds of corn to the hundred, and the other one went 20, so you can see that on the larger cob we are getting less corn per cob.

Now, take this cob, 10 inches long, and $7\frac{1}{2}$ inches in circumference, with a straight row from butt to tip, with a straight row evenly filled out to the end, and uniform in size and shape. I would rather have an ear of corn filled out well, than to have it run down well to the end. Here is another ear, which started out very good, but these grains ran along, wedge-shaped to the edge. Now, when you get up to within an inch and a half of the top, you get a very poorly filled out corn and while it has a few more grains to the end, it has lost 250 on the butt.

Now, I see the one main reason for these different sizes of cobs is that you have in your state no standard. That is, you have never had explained to you, and have no organization which has adopted a standard for an ear of corn. In our state the north is now running about 9 inches, and the south about 10 or 11 inches, and that is giving the best results.

I am unable to discuss the subject fully in the short time I have, but I will say that I think that we have come to the place where we think we have the best of the corn situation in Indiana. We have

2,500 plots on farms. We have gone into the country and set the standard at 100 bushels per acre, and as a result we have raised it; in one case the average was 55.1, where it had formerly been 25; in another 46, and so on, all over the state we have succeeded in getting a better standard. We have given them a better variety of corn, but the question is how to raise the standard. Now, we have statesmen in our state, and I don't know but what you have them in your state; they are usually round: Last winter we needed 300 bushels of corn to apply on our farms, and we went to the man and said, "We need this corn," and these statesmen sent us down the best corn. Then we took the different varieties of corn and laid them out in rows, and marked them one, two, three, and so on. Then we made boxes about three feet long and 2 feet wide, and put up little bars inside about 3 inches square, of galvanized wire, and filled these boxes with sand. You can do the same thing, and these boxes can be filled with sand or ground. Then we took from No. 1 five grains, and planted them in one of these little squares, putting in a marker, "No. 1;" in the next square No. 2, in the same way; and so on. Then we put a cover on the box of a piece of carpet, and kept the box at living room temperature, and at the end of five days you can tell whether the seeds are going to show up good or not. If at the end of five days it has germinated you will probably get good results from the corn; if not, you had better throw it out. If you don't you will have trouble.

Here is an ear of sand-hill corn, which is near the desired standard for an ear of corn. Here is another corn produced with more sunshine, and more moisture, but which gives you just about one-third as much as the other. Here is another sand-hill corn, raised in moisture, which produced these nubbins. There is something wrong in the breeding of this corn, and if we could get back to the original stalk we would find the same thing. Here is another, and if, as we are told, corn reproduces itself, this will not produce an ear of corn. Instead we have nothing but barren stalks and tassels. Now, right here in germinating, we can pick out the poor ears and cast them aside. If you do this it will give you in return dollars and cents.

Now, as I said, there are many other things here that it would be well to talk about, but the hour is growing late, and a few questions may be in order. If any of you people have any questions, I will try to answer them this evening, but you will find if you ask them, that I don't know all about it.

PAPERS READ AT THE EIGHTH ANNUAL MEETING OF THE PENNSYLVANIA DAIRY UNION, HELD AT HARRISBURG, PA., JANUARY 24 AND 25, 1907.

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ADDRESS OF PRESIDENT.

By Prof. H. E. VAN NORMAN, *State College, Pa.*

The president's address is often looked upon as a necessary evil, and it may be so. I want, in my remarks this afternoon, to call the attention of the dairy interests—and when I say “dairy interests” I mean that use of the term which includes butter making, milk shipping, cheese making, breeders of dairy cattle, in fact all the dairy interests of the state—to the possibility that stands before us.

The Dairy Union has seen the milk shipping business of this state very largely increased; at the same time, there is an increased demand for more of the best butter, and to the dairymen who are making the butter, I want to say that if they would increase their product and get a good price for it, there are three things to be taken into consideration: First, that you make a good article; second, that you make it good from day to day, uniformity being one of the

greatest factors in success; and, thirdly, that you have good facilities to get the same to market. I have been impressed with the demand there is for a good article. The consumer asks, "Where can we get good butter?" and "Where can we get good cream?" the ice cream people are going further and further from the large cities to get their cream, and in the smaller towns there is an increasing demand for good ice cream and for good cream. There is more and more ice cream being used, and what used to be a luxury has become a necessity, and every housewife is appreciating, as she should, the value of good ice cream as a dessert.

The demand for cream for ice cream raises the question whether that is the best way to dispose of our milk. It is, if we use the skim milk wisely. If you do, it usually makes the highest priced market we have for the cream. I would ask you, therefore, to consider that in the sale of cream for ice cream there is a marked growth and a growth that will continue for some time.

Our city consumers are losing faith in the integrity of their milk men in a great many cases, and they want somebody to certify whether they are getting a good clean milk, and there is, consequently, an increased demand for certified milk. But we will hear more about that later in the evening, so I will simply call your attention to it, that at the present time the public wants more milk that is pure, and clean, and free from the bacteria of filth and disease. I tell you, that the city people, with their babies to be fed on the bottle, find it a very serious problem to secure good milk. An important question to the father and mother is to get a milk that can be fed to growing children with safety, and it is worth our while to let them know that we have such an article to offer them, and to get their orders. I think there should be a difference in price between a good article, and an inferior article. In many cases the milkman with a good article is getting as much as it is worth. I think our consumers should refuse to pay so much for the poor milk, and more for the good. This will make the milkmen discriminate. This question of raising the quality, and getting the consumer interested in it, is one of the problems of the milkmen. The only way to do that is to produce a good article, and then insist upon having a good price for it.

Now, a word to our breeders of dairy cattle. I am glad we are here with the Breeder's Association. I wish my colleagues in the dairy work would heed the teachings of the Beef Breeders' Association regarding pure bred stock. I want to impress upon these men that one of the most important means of raising the standard of our dairy cattle is by getting pure bred sires into the common dairy herds. Many years ago our breeders of beef cattle had an over supply of registered beef bred bulls. Some enterprising man took a lot of them to the range and from them has developed a class of steers that is today ahead of those in many of our older states and created a market for thousands of registered beef bred bulls. Why? Because they have pure bred sires for several generations and their offspring show the influence. If you go into our large packing houses today you will see many animals that show the marks of the pure blood of the beef breeds. If our common dairy herds can be improved by putting in pure bred sires, then the owners of registered dairy cattle should be among the first to encourage the pure bred sires.

We want the largest amount of milk for a given amount of feed. The average now produced in this state is 150 to 160 pounds of butter fat per cow per year. The average in our college herd for the last six years, running from 22 to 32 cows per year, is 270 pounds per cow. We do not have pure bred cows, but for 10 or 12 years the college has used the best pure bred sire they could get. Sometimes they have been hindered by lack of money; sometimes because they could not get what they wanted, but they have always used the best sires they could get, and the result is apparent in the yield of fat. I suppose these results could be duplicated on every farm in Pennsylvania, but sometimes we farmers don't know what is good for us until some one comes along and sticks it under our noses. Then we see the advantage of breeding pure bred cattle and of getting the record of what the cows are doing, and of bringing these things to the notice of the farmers. If there is any man who wants help of this kind most, it is the man with scrub cows. When we can get in touch with him, we will be doing just what the man did who went out on the Texas range with his surplus of registered bulls did to improve the beef cattle from the plains. Often you don't know what to do with a bull calf, so you kill him or give him away. If he has a mother that has a good butter fat record, that is the last thing you ought to do. It will pay to raise him, and get more of the pure bred sires into the common herds of the State.

I want to urge upon you the necessity of keeping a record of the butter fat of each cow. You have to keep that cow 365 days in the year. What does she give you for it? I can show you records of men who are not getting a dollar's worth of milk for a dollar's worth of feed, and I have seen cases where they only received 99, or 70, or 80, or 90 cents' worth for a dollar's worth of feed. They have the same kind of feed, and they have the same kind of stock; what they need is a record of what each cow is doing, so as to eliminate those from the herd that are not paying. There is not a man of you but would require of a man five dollars in change for a five dollar bill, yet there are many of you here who are keeping cows that are giving \$30 worth of fat in a year in return for \$29 to \$32 worth of feed, when you might be getting \$50 or \$60 worth. Keep your records, and then add a little more care in the handling and feeding of that cow, and see what the results will be.

To go back to the Dairy Union a little bit. I have two or three suggestions to submit: I hope the Nominating Committee, in selecting the officers, will bear in mind to select men who will help push along the work, so that it will develop into larger usefulness. The only object of this association is to help the dairy interests of the State. It is by developing the industry as a whole that we help ourselves. You know we are all a little selfish, and what helps the union helps us. One man may not be able to do much, but if each man is willing to do his little part we will have strength and energy enough to carry the great work along. I would like to see in another year, two days given up to the discussion of strictly dairy subjects, such as butter tests, pure bred herds, scrub cows, cheese making, butter making, starters, butter scoring, etc., all of which we can use to advantage.

I would like to see a large exhibit. It was with fear and tremb-

ling that your officers this year decided to have an exhibition of dairy machinery and of dairy products. The machinery manufacturers responded, and have sent us an exhibit. Now you want to do your part by showing your interest in them; when you want to buy machinery, buy from them, from the people who have sent their exhibits here.

We are disappointed that there are not more dairy products. We did not get our advertisements out early enough I fear. Next year we will do better. Many who have a market for a medium grade article will not be able to hold it if some one offers their customer a better article at the same price. When the market is flooded it is the man with the best goods that gets the top price.

The milk exhibit will be spoken of by a man who is making the examinations. I would that we might see an exhibit from every creamery.

In our meetings there has been much stress laid on the thought that you cannot make good butter from poor cream. If you have patrons that are delivering good milk and cream send samples of it to compete at this show.

I want to express my appreciation of the efforts of the Vermont Farm Machine Co. in getting out exhibits from their customers. They offered special prizes to the makers of butter who use their machines, and I believe that the exhibit of butter here is largely due to their efforts. Let us see what we can develop next year in this line.

I would like to call the attention of the farmers to the desirability of forming associations in your neighborhood, for the testing of your cows and securing the records of the cows in your district. Three different creameries have stated that they are willing to pay \$100 each to have a man come there at stated periods, say about three times a month, and test the samples of milk. I am not prepared to say today just what I can do, but if eight or ten creameries get together in this way, the expense on each one would be very slight and I would get the man and guarantee his work.

Now, just a word regarding the butter. I fear that some of you who are exhibitors here may be disappointed in the scores. I selected the judge, and he has judged it on the basis of the market requirements. If some of you have a low score, and are getting a top-of-the-market price for it, don't be discouraged, but go ahead and see if you cannot secure a high score and yet please your customers also.

I submit the following recommendations for your consideration:

1. That the Dairy Union should work for the passage of laws that will secure the registration of creameries, cheese factories and similar establishments, together with sanitary oversight of such places and the farms where products intended for sale are produced.

2. The establishment of a great State Fair commensurate with the agricultural interests of this State, the value of the agricultural products being greater each year than the combined value of coal, iron and oil produced annually

3. A law defining certified milk and providing for the proper use of the term.

4. The securing of such appropriations to the Pennsylvania State

College as will enable the Dairy Husbandry Department to have several traveling instructors to assist the cheesemakers, butter-makers and milk producers in improving the quality of their products and stopping many of the leaks that now exist, also to gather such information as will enable the department to be of greater use to the dairy interests of the state.

5. That Professor Harry Hayward, who did so much to help forward the work of this Association, be made an honorary member.

6. That Article 3 of our Constitution which now reads, "Any person interested in dairying, whose name is approved by the membership committee may become an active member by subscribing to the Constitution and By-Laws, and by payment of the annual fee of one dollar," be amended so as to read as follows

"Any person, firm or agricultural organization interested in dairying, may become an active member of the Union for the calendar year upon payment of one dollar, or may become a life member on payment of ten dollars, or after having paid ten annual membership fees.

"Any agricultural organization holding an active or life membership in the Dairy Union may list its members as associate members of the Pennsylvania Dairy Union for the calendar year on payment of 25 cents for each member, and shall receive as many copies of the annual report and other publications as it has associate members. Associate members shall have all the privileges of membership except voting and holding office.

"Any person rendering this Union noteworthy service may be elected an honorary member by unanimous vote at any regular meeting. Honorary members may not vote or hold office, and shall be exempt from dues."

Now, here is the point that agricultural societies may list their members as associate members of the Dairy Union. Many societies of this state which are interested in dairying, are not represented here, because it is too far for their people to come, or for their Grange, or Farmers' Club, or whatever organization they may have, but by the payment of the small fee of 25 cents they become members, and receive the publications, and their interest is aroused, and the work spreads. I have also provided that any organization may become a life member upon payment of ten dollars.

REMARKS ON THE PRODUCTION OF MARKET MILK AND REPORT OF MILK AND CREAM CONTEST.

By IVAN C. WELD, *Dairy Division, United States Department of Agriculture, Washington, D. C.*

I am very glad to have this opportunity to meet with the dairymen of Pennsylvania, and to discuss with you a subject that is closely related to your prosperity as dairymen, and to the general welfare of the community as a whole. We are a milk consuming

people, and it is a significant fact that the human race for many years has been becoming more and more dependent on cows' milk for food. That our dependence on the cow for this food will increase as times goes on, we cannot doubt. As dairymen, as producers of market milk, you are expected, for a just compensation and a fair profit to feed the people. You must then, for your own benefit as producers, keep in close and sympathetic touch with the consuming public. You must ever be ready to anticipate the wants of the consumers, and to supply those wants, if you would secure and hold their confidence and win for yourselves a profit in your business.

It is for your best interests that the consuming public have absolute confidence in you and in your ability to produce and to deliver into their hands a food product that is pure and clean. It is a long time since it was discovered that cows' milk was good for food. It was one thing for primitive wants, but it is quite another problem under present conditions to produce and transport long distances milk that shall satisfy the appetite of the millions of human beings who have never milked a cow and perchance have never seen one.

It was evidently intended by the Creator of all things that milk should be furnished to the young without ever coming in contact with the atmosphere, and foreign substance or things whatsoever. Under such conditions, all agree that milk has no perfect substitute. When, however, man makes his hands take the place of the calf's mouth and the milk, instead of going directly to the calf, passes through the air into a bucket, he has interfered with the natural process, and the condition of the product when it reaches the consumer will depend almost entirely on the conditions under which that milk was secured and cared for. The producer is largely responsible for those conditions, and he should accept his responsibility like a man.

In the great interest and haste in matters pertaining to the breeding and feeding of dairy cattle for the last dollar obtainable, the sanitary side of the dairy business—the matters that pertain to the health of the cow and the health of the consuming public—have, in many localities been neglected. Neglect, however, could not always remain covered for the natural result of uncleanness in any kind of work must sooner or later make itself known. Thus it is that negligence or ignorance on the part of some one is occasionally uncovered in various parts of the country by the discovery of disease in herds of dairy cattle, or among people who have obtained their food supply from a common source.

Many dairymen now know and many others have yet to learn something of the nature and influence of even a little dust in the air of the stable, or a little loose dirt or hair on the cows' udder and flanks at time of milking. Many dairymen now know and many others have yet to realize that a milk pail, strainer or can that has not been well cleaned may become a source of trouble.

Many dairymen now know and many have yet to learn that even a very small piece of dirt, a hair or a fly falling into the milk carries with it many thousand small plants which find in the milk conditions well suited to their growth and increase. Dairymen, as a rule, are careful to strain out these visible things when by some accident they get in the milk. If these little plants or bacteria were only large

enough so that the dairymen could see them, he would doubtless remove them also. Unfortunately he cannot see them or remove them. Hence it becomes the part of every honorable milk producer to observe and practice such methods as will keep bacteria out of the milk, so far as it is possible to do so.

Second only in importance to cleanliness in all its details is the matter of the prompt and efficient cooling of milk. The cooling cannot take place too quickly after the milk leaves the cow, neither can the temperature be made too low, provided, of course, that the milk is not frozen.

The dairymen who are today furnishing the best milk to our city markets are the dairymen who are the most exacting regarding the conditions of cleanliness and low temperature, and I may also add they are the dairymen who are making the most money.

Unfortunately there are various standards of cleanliness among producers, as well as among consumers of market milk. Conditions which may be acceptable to one person may be offensive to another, hence the desirability of producers occasionally exhibiting their products at dairymen's meetings, and having those products carefully examined and scored according to definite and well established standards of excellence. If there can be friendly rivalry among the dairymen for the highest score and honors, so much the better as that helps to stimulate and to encourage the consideration of conditions which make possible the production of a cleaner and higher priced product. You have done well to start such a movement in this Dairymen's Association. Here is much yet that remains to be learned in connection with the production and distribution of milk and this association, by encouraging exhibits of milk and the discussion of influences and conditions affecting its production and distribution, can do much to promote the interests of all milk producers in this state. You will also render a public service—a service that should entitle you as an Association to public recognition and support.

Although the number of entries in the first exhibit is not large, a beginning has been made that should eventually lead to substantial results.

In discussing the method of scoring these samples let us first consider the matter of flavor. Forty points out of 100 are given to this, because flavor or taste is a very important thing in milk; no matter what other desirable qualities it may possess, if it does not taste good no one cares to use milk for food.

Composition, that is the percentage of fats and solids not fat, are given 25 points. It is important that the quality of the milk be good and up to established standards.

Under the head of keeping qualities is considered the number of bacteria per cubic centimeter, and the degree of acidity or sourness that has developed. It is important that the number of bacteria be within such limits as will ensure the healthfulness of the food. An excessive number may also affect the keeping qualities, while the amount of acid developed indicates to what extent, if any, the milk has already soured. The number of bacteria may also be considered as an indication of the degree of cleanliness and care which is practiced by the milk producer.

The appearance of any article offered for sale has an effect on the

consumer and also influences the selling price. It is, therefore, important that milk be put up in clean bottles, that the bottles be kept free from metal parts, that the caps fit tightly and present a neat appearance. There is also another thing considered in judging milk and that is the matter of sediment. Now, sediment is something that should never be found in milk. Unfortunately it is oftentimes present, and when found its appearance in the bottom of the bottle cannot fail to be disgusting and repulsive to the consumer.

All the above conditions are considered in detail, and the score of the milk is affected according to the conditions found.

The conditions found by me in the milk exhibited at the meeting have been plainly marked *on* the score card, which can be found with each exhibit. The summary of these conditions, including a few samples purchased on the streets of Harrisburg, are as follows:

REPORT OF MILK AND CREAM SAMPLES EXHIBITED AT THE MEETING AND PURCHASED ON THE STREETS OF
HARRISBURG, PENNSYLVANIA.

Number.	Fat.	Total solids.	Acidity.	Flavor.	Appearance.	Bacteria per C. C.	Score.	Remarks.
1.	4.86	13.88	.198	32	10.	925,600	84.	Cream.
2.	4.80	13.62	.188	36	10.	539,200	90.	Sediment.
3.	30.50	.....	.181	36	10.	34,160	96.	Slight sediment.
4.	4.29	12.79	.181	33	9.	1,376,000	79.5	"
5.	6.03	14.95	.175	33	9.5	1,376,000	82.	"
6.	10.50	.....	.144	34	10.5	190,000	85.	"
7.	5.29	11.21	.189	34	9.5	850,000	86.5	Slight sediment.
8.	9.60	.....	1.92	33	9.5	11,290,000	58.	"Double cream,"
9.	3.60	.....	.19	30	7.	3,789,000	62.	"Past'rd." Much sed.
10.	4.60	12.57	.19	34	9.5	4,400,000	68.5	Slight sediment.
11.	10.75	.....	.195	20	9.	5,706,000	56.	"Team." Sediment.
12.	4.26	15.04	.294	25	8.	1,675,300	82.	Sediment.
13.	5.30	13.86	.174	34	10.	861,000	86.	"

ADDRESS.

By DR. WM. HART DEXTER.

We are all very sorry, I am sure, that Mr. Webster is not able to be here today. It becomes my privilege to stand in his place. I wish to make your acquaintance on the right basis and to have you understand in the first place, what the work of the Dairy Division at Washington is. From the very excellent work that is being done with limited means at your own State College, and realizing after the address of yesterday by Mr. Hunt, how much more is needed, I am sure that you are in a position to appreciate the readiness of "Uncle Sam" to assist the varied interests of the different states without interfering with your state rights to do in your own State what your institutions ought to do.

The Dairy Division of the Department of Agriculture at Washington aims to be, and is to a large extent, a clearing house for ideas. It was not primarily an institution for research; it is not intended to do other people's work for them, but it was organized to learn the most successful dairying methods from the different parts of this country and other countries, and to learn also the dairy needs of our own country especially, and to tell the better ways of doing the things that need to be done, so that all the people who need to do these better things could learn how.

During the last year the Dairy Division has doubled its working force and improved its organization, so that now we have the different classes of investigations provided for, as you will see by this leaflet (showing leaflet) outlining our work, and telling you of publications of interest to dairymen, many of which you can have without charge if you ask for them.

You will learn of some of our market milk investigations this evening, in connection with the report on the milk and cream that has been sent here. We are making a study of the dairies that supply Washington with milk. There are about 900 of them. About 200 of them have been examined already with the use of a score card, which indicates a standard of excellence. This standard is such as can be adopted by any city, and we shall be glad to help any city that wants to try it. Cleveland is already trying it with encouraging results. The plan is such that the producers and dealers can find their records with the Board of Health, and can see there where they fall short and how to increase their rating without materially increasing their expenses. Their attention is called to facts which they may have overlooked, or points wherein their foremen have not carried out their instructions.

We would be glad to assist you in the work of inspection which your President has suggested, and if desired would send you a man to go with your inspector, as has been suggested, to make the first tests.

We have a butter expert at work here examining the butter, scoring it according to the market value and explaining its defects. He has shown at the creamery session how to determine the amount of water in butter, using the new rapid method and device invented by our Mr. C. E. Gray, which promises to do for butter what the Babcock test does for milk. This is a device patented by the Department of Agriculture for the benefit of the public. It can be had of the manufacturer at a slight charge for a royalty to the inventor.

Our cheese experts are at work in Connecticut and Wisconsin with the purpose of ascertaining the best methods of making cheese of the European and American varieties. Swiss cheese is now produced in Wisconsin in almost the same form as in Switzerland.

We are also pushing Southern dairy investigations under special appropriations by Congress, so as to ascertain the difficulties peculiar to that section and overcome them. Our field agents visit the dairy farmers, manufacturers and dealers, co-operating with them in the introduction of improvements.

We have a building expert at work so that we are able to recommend suitable plans to those who are about to erect dairy buildings, and we furnish sketches of such plans so that we may learn in return what are the actual benefits of such improvements and then pass them on to others.

We have our dairy laboratories at Washington, where we are now ready to make such investigations as are necessary to supplement the lines of work carried on at various outside stations.

In co-operation with the State College of Missouri, we are conducting investigations of the composition of normal milk as affected by the age, feed, breeding and lactation of the cow, and the nature of her care and surroundings. We want to find out what milk really is, and how it varies naturally.

We are inspecting the manufacture and sale of renovated butter throughout the country, as required by Congress.

The Division now has 46 employees, 31 of whom are scientists, and seven engaged in inspection work. Write us fully and ask us any questions that you would like to have us answer, and we will do all that we can from Washington to help you.

May I say a few words of encouragement to the dairymen as to the general advantages which it seems to me are not appreciated as highly as they should be, advantages which belong to the occupation of the farmer, especially of the dairy farmer? I find that young men in a great many places have an entirely false and unworthy notion of what farming really is, what it really affords, for example, in the way of independence, of opportunities for profit, and for social pleasure and comfort. You, with your broader views, I presume, are already doing missionary work trying to raise the lamentably poor conditions of some of the farms around you, as you see them. Our boys should learn from us the advantages of the dairyman's independence of living as compared with the constant limitation of the freedom of men in other employments. We could show our girls and boys and our neighbors how really less capital is required to start profitably in the business of dairy farming, than in almost any other occupation. I wish we might appreciate also the advantages of the dairyman's home, in the fact that all the members of the fam-

ily can be occupied in some profitable way, without unnecessary hardship on the dairy farm. I wish we might appreciate the fact and tell our neighbors how delightful is the work of the dairy farmer, how life in the open air and the interest being with living things gives health and vitality to body and mind, and makes hopes glad. Perhaps you are not in the habit of thinking enough about these things, and we forget to speak often about them to our boys and girls. I wish we might bring it home to them that our occupation really develops the most desirable habits of industry and economy and good morals. I wish we might impress upon them that surroundings most helpful to manhood are found on dairy farms. I wish we could make them see how especially calculated is dairy farming to show that labor is honorable, and that it is worthy of all their best efforts. And standing here in the State Capitol, I am impressed with the idea of special opportunity which comes with dairy farming, of honorable participation in political life of the better sort. No occupation offers greater possibilities of political leadership than dairy farming.

Your President has stated the importance of knowing the needs of the dairy. We should make these needs better known through the newspapers. Perhaps some of you noted, as I did, the small importance that seems to be attached by the city press to this meeting. The only indication that I could find in the Harrisburg papers this morning that this convention is being held, was a small item in one of the papers, barely mentioning it, and saying that the program was being followed; yet the Governor was here and presided for an hour! Now, the daily paper has a large share in the instruction of your boys, and I mention this because of the importance of bringing our work properly before the representatives of the press.

I will only urge a few suggestions as to the special advantages for dairying in Pennsylvania, and then I will stop, because I know you are anxious to hear the others who are to speak at this session.

To the dairy farmer there is no more important question than that of the water supply. In this state with its mountain springs and many streams, water is abundant.

I was quite impressed at the creamery session this morning with the fact that your butter makers seem already to have found sufficient markets for their product. Another advantage is the ease with which the markets near home can be reached.

You have the advantage over men in other forms of agriculture, in that you are turning the rough products which others sell into the finer and more finished products less bulky and more valuable, so that you are able in selling butter and cream from your farm, to do so at a less cost for transportation, and thus, of course, to increase your total profits.

There is another advantage partly discussed yesterday by Prof. Hopkins, in the increased value of the land which comes from dairy farming. I could give you reports from other states, from Germany and from Denmark that go to show this. Where they raise one crop exclusively, such as tobacco or cotton, the farm loses fertility. Some of the great farms of the west, once producing year after year enormous crops of wheat, have been brought by that system down to a yield of only eight or nine bushels per acre. But now, with dairy

farming they are going up again to yields of 30 or 40 bushels, and to largely increased cash values for the land.

I would like to show you the value of the co-operative cow testing associations as developed in Denmark. The average increase in milk production after five years' trial was nearly 1,000 pounds per cow per year. The average increase in butter was 43 pounds per cow per year. I would like to discuss this with you at some length, but I will merely suggest that you join in the plan for co-operative testing as outlined by your President. We will help you from Washington all we can. I will not go into this argument with you, as I understand that Mr. Van Alstyne has already given an excellent talk on this subject; I will simply add an illustration: A little herd of 12 dairy cows up in New Hampshire produced in the course of a year a net profit of \$195.83—a small amount—but the profit from the best cow was within 30 cents of the combined profit of the first six cows in the herd. Four of these cows barely paid expenses. The owner of this herd might sell his six poor cows and lose no more profit than if he only sold his best one. So, unless you keep a record of each cow's production, you do not know where your profit comes from or just what you are doing when you buy or sell cows.

We, who know, are under obligations to do better things ourselves, and to raise the average of the farms around us. It is so pitifully low. In an average neighborhood into which one of our men went, he found that the average production of butter of the dairy herds supplying milk to the creamery was about 140 pounds per cow per year. After he went there and worked with them, the herd on which he was employed averaged 280 pounds of butter per year per cow, just twice the previous average of the neighboring herds. You will very likely find similar cases around your own home. Appreciate your opportunities to raise the standard in your community.

It is encouraging to know that a more scientific and reasonable understanding of the advantages of dairying is coming to both men and women. About a year ago I had the pleasure of talking with a woman who is most enthusiastically interested in supplying certified milk to the people of Chicago, having a farm a few miles up the lake, where she maintains sanitary conditions, and sets a fine example to many of the men engaged in supplying milk to the city. I also learn that Philadelphia is receiving a high quality of certified milk, a sample of which will be shown here tomorrow, produced by a successful woman dairy farmer, personally interested in the occupation which she adorns.

Let us go home from this Convention holding our heads high as successful dairy farmers, and while we congratulate ourselves on the advantages we have, let us urge our boys to go to the Agricultural Colleges and learn how to do things scientifically, and when they return with thorough preparation, let us join with them in practical application of the best methods to the advancement of our common interests.

SOME THINGS IN DAIRY FARMING.

(An address prepared for the Dairymen's Convention at Harrisburg, Pa., January 24, 1907, by Hon. W. D. Hoard, Fort Atkinson, Wis.)

What does it mean to be a dairy farmer of today? This is a very important question to everyone down the long line of men who make up this great dairy industry. There is no man in that line who is as important to the industry, as the farmer back on the farm. On him must rest nearly every important consideration; the quantity of the product, the quality of it, for here he governs completely; the stability of it for if he finds it unprofitable the whole line wavers and is thrown into confusion. It is his honor, conscience, intelligence and watchful care that determines the quality of all the products of the cow. On quality depends consumption, and on consumption depends price and profit. All this depends on the man behind the cow. Then, besides, the character of the cow herself depends on his intelligence, discernment and enterprise.

The dairy farmer is the man at the switch sending the train along the right track or stalling it on a siding.

We have only to think this business of dairying out to its roots and branches to see that all the forces of education, law and public opinion should be enlisted to make the dairy farmer understand his own importance to the whole, and fully and thoroughly understand what it means to be a dairy farmer of today.

In thousands of instances the love of money, larger profit, better reward, is not enough to make thinkers of unthinking men, who keep cows and unprofitably fill the place of a profitable dairy farmer. And so there must be constant agitation of the subject, constant stirring of thought, constant holding of conventions and institutes; constant reading and study, that if possible, these men who keep cows and do not realize what dairying means, may be reached and lifted up until they can see the question in its true light.

Think of the great width of this question. Think of the vast army of men it supports from the farm to the creamery and cheese factory; to the thousands of dealers and commission merchants; to the manufacturers of machinery and dairy supplies; to the great transportation interests on both sea and land that look to it for sustenance. Then think of the millions of consumers who wait upon the cow and all these intermediaries for their daily food. The cow makes it right, pure and good. If there is anything wrong with it, it comes from the ignorance, indifference and wilful neglect of the men who stand between the cow and the consumer. Chief among these is the farmer. He must be held to the largest responsibility for he has the most to do with the milk at the time of its greatest liability to bad impressions. At every stage beyond him modern science has done more to perfect the way than it has at the farm, and this for the reason that farmers, as a class, have not believed in science. They have not taken an educated mental interest in their

business. The domain of science is in the mind and farmers have had but little mind for it. Hence, they do not see how it bears upon their work. The greatest problem in agriculture today is to get the farmer to see where science touches him and his life work and so take advantage of what she has to give.

Right here lies the larger meaning of dairy farming. I have spoken thus in a general sense so we may take a larger view for a moment of the great field dairying occupies and the necessity that exists that the dairy farmer should comprehend well his own relation to it. I have selected a few special lines to talk upon that bear most sharply upon the farmer. First of these is the breeding of the right kind of a cow for his work. Do you know that when we come to study into this question, it is absolutely appalling to see what enormous losses the farmers of the country sustain because they will persist in breeding and keeping cows unfit for dairy work.

Hoard's Dairyman has spent \$3,000 in taking cow censuses in ten states, from Iowa and Minnesota all the way to New England. In several of these states such as Wisconsin, Ohio and New York, several censuses have been taken. In the main they were of 100 herds each. As accurate study as possible was made of each cow, in each herd, and a statement made of what she earned at the creamery and what she cost in feed.

From this mass of testimony the best that has ever been attempted, we find that fully one-third of the cows are kept at actual loss.

Think what a drain upon the farmer and the country this is. Is it not time that the men who keep the cows tried to obtain a better understanding of what it means to be a dairy farmer?

THE UPWARD STEP.

We are all affected by our environment. How universally true is the old saying "A man is known by the company he keeps." There is no getting away from the influence of association. Every farmer is subject to it. The books and papers he reads are his associates, just as much as the men he meets. One of the greatest dairymen Wisconsin ever produced was Hiram Smith, of Sheboygan county, who died in 1890 and for whom one of the important buildings on the University Campus, the Hiram Smith Hall, was named. One of his favorite sayings was "A registered sire is a great educator. It is an upward step." He had seen farmers about him in all stages of development and with no development and he declared that there was no hope of a man's upward progress as a farmer just as long as he kept a grade or scrub sire. Here again do we see the effect of the law of association. We have noted it ourself in hundreds of instances. All about us in Jefferson county, Wisconsin, now noted for its production of dairy cattle, are farmers who have made handsome progress in knowledge and wealth. Their progress dates from the very hour that they commenced keeping a pure-bred sire. A large proportion of them are Germans, who have been obliged to learn to read English in a slow and difficult manner. They saw the improvement that came in their neighbor's cattle from such a sire. That set them to thinking. Buyers came and paid more for the heifers and cows from such sires. The buyers were a

different order of men. They talked on an upward grade. Here was another association. One good sire at registered prices, succeeded another. That was more association. Their minds began to expand; they could see more in this business of dairy farming. Their farms are selling for \$100 to \$150 an acre. They sell annually a half million dollars' worth of cattle. Their sons are going ahead, making more intelligent dairy farmers than did the fathers. They are attending the short course at the College of Agriculture. Several of them have branched out into breeding registered cattle. In 20 years there will be hundreds of such breeders in Jefferson county. Who can measure the influence and effect upon a farmer when he commences to associate with pure-bred cattle.

Yes, Hiram Smith was right "A registered sire is a great educator." "A man is known by the company he keeps." Scrub cattle will hold a man down to scrub ideas on general farming. There can be no "upward step." The influence is retroactive on both the farmer and his cattle. Better ideas lie at the bottom of all betterment.

There are a hundred copies of dairy and agricultural papers read by our Jefferson county farmers today where there was one 20 years ago. The barns, the fences, the fields of alfalfa, clover and corn, all show an upward trend in thought as well as in the methods they practice. How powerful has been the reflex effect of this law of association. Let us be careful of the company we keep. "Birds of a feather flock together." When a man buys a registered sire he gives notice to the world that he is on an up grade himself in his ideas of cattle. It will not be long before he will think towards improvement in other things.

KEEP THE CALVES DRY AND CLEAN.

Every human mother, that is fit to be a mother, knows that if her baby is allowed to remain wet and uncleanly, it will soon grow sickly. The bovine baby is strictly amenable to the same law. Every calf raiser must have seen the ill effects of allowing calves to lie in their own voidings and urine. A farmer was once showing us his stock. His horses were bedded down with an abundance of straw. His calves were lying in filth and moisture that made us indignant to behold. "What are you raising those calves for?" we asked. "To make cows of them," he replied. "Oh, no, you are not. You are raising them to be weak sickly failures," was our answer. He confessed to us that he had lost a good many calves, but he never had thought that the way he kept them was the cause.

Turn a calf or a pig out in the woods and it will find for itself a bed of dry leaves in a clean place, and they will keep healthy, if they have food enough.

In my own calf stable every winter are from 25 to 30 calves. Around the outside, next to the wall, is a feeding alley. Then comes a row of stanchions, the only place on the premises where I use a stanchion. Then comes the open ample room with a dirt floor. This is covered every day, and if necessary, twice a day, either with bright dry straw or shavings. This floor is sprinkled night and morning with a good disinfectant. The calves are fed in these

stanchions, with skim milk, fresh from the separator, in clean tin pails twice a day. Then they are given a feed of oats or barley meal, followed by alfalfa hay. All this consumes an hour, say. Then they are let out of the stanchions to run at will on the floor. Twice a day they are let out in the big barn yard to have a run and play. Fresh water is kept standing before them, on the floor of the stable, all the time.

Now this care takes a little time and thought. But you can never have skill and good judgment, nor the rewards of skill and judgment, unless you invest time and thought. All this care has a great effect on the future cow. I have raised but one heifer, pure bred or grade to cowhood in 15 years, that would not produce 300 pounds of butter and over a year. It is this careful developing care and feed, I believe, aided by good breeding, that has given me these results.

Don't you think I have made a good deal more money with my cows by this method, than I would if I had pursued the common neglectful way? Farmers have not yet begun to half think, on the fine possibilities there are in the production of valuable cows. The demand for dairy products, all over the Union, is far ahead of the supply. And the cleaner, sweeter, more perfect we make that product the more does the demand increase.

Think of the demand there is, today, for good cows. A few weeks ago Mr. F. B. Fargo, of Lake Mills, Wis., placed a five-line ad. in Hoard's Dairyman, offering to furnish Holstein grade cows by the carload. In two weeks' time he had received hundreds of letters, as far distant as Texas, Mexico, California, Oregon and the states on the Atlantic coast, the writers of which were all anxious for one or more carloads. He was amazed at the demand. It is so in other dairy breeds. Don't you think it will pay to turn your attention to the question of producing superior cows for your own use and the market?

The present methods of handling cows, in the great milk producing centers, amounts to the destruction almost of all calf raising. Cows are bought, fed high for a year or so, and sold to the butcher. This makes all the better, the chance for the intelligent, far sighted, dairy farmer to make a handsome profit in growing cows to supply that market.

A GOOD SIRE.

There is a great host of dairy farmers who cannot yet see the cash advantage of buying a pure-bred bull and paying the going price for him. The price blinds their eyes, and so they go around looking for a cheap bull, not one that can bring them something good in return. They will say, "Oh, I'm not breeding registered stock. I cannot afford to pay the regular price for a bull." That is short sighted economy as sure as they live. They are keeping down the quality of their own cows in the future and the value of the young heifers they may want to sell. An Illinois man who annually buys over a hundred thousand dollars' worth of cows and heifers in Jefferson county, Wis., said to me recently, "I buy a cow on her looks, but I never buy a heifer until I take a look at her sire. If he is a good one, I am more confident of the value of the heifer."

Now, here is a practical example drawn from my own experience: In February, 1902, the Guernsey bull, Starlight's Excelsior 7992, was born. He was bred by the late N. P. Fairbanks, of Lake Geneva, Wis. I bought him when little more than a calf, paying a price up in the hundreds for him. I was attracted to him by the rich character of his pedigree, the excellent record of the cows back of him and his strong prepotent appearance. He will be five years old February next, and is in his prime. From that bull I have sold \$810 worth of grade Guernsey heifer calves, \$1,500 worth registered heifer calves, \$2,000 worth of registered bull calves, making a total of cash sales of calves, from him, of \$4,310. I have on hand six of his heifers in milk two years old that I can sell any day for \$1,500, and 18 of his calves with nine more to come that are worth at a low estimate \$2,500. This makes the total value of his stock up to date, \$8,310. Cut it in two, giving one-half of the value to the cows and then the bull stands credited with \$4,155. Could I afford to pay a good price for him?

When I was a boy I read in an old almanac this verse:

"A fiddler had a cow and he had nothing for
to feed her.
So he took his fiddle and played the tune
'Consider, cow! consider.'"

Allow me for a few minutes to sing the changes on the word "consider." Please consider that the grade, heifer calves of this bull such as any farmer can raise if he will but have rich blood in the bull to start with, brought me \$810, double what he cost me. It is hard to make dairy farmers see that they want good well-bred stock themselves; next, that there are thousands of other farmers that want it more than they do and are willing to pay for it. Consider, that there is no one form of our live stock to-day that is so scarce as good cows; that in the natural evolution of public conviction, cows will be scarcer owing to weeding out of unfit cows and consequent reduction of the size of the herds; that the consumption of milk as a food is increasing to an enormous extent and as a consequence is stiffening the prices of butter and cheese. In most of the butter and cheese producing districts there is a noticeable lessening of production owing to the drainage of cows away to other sections for city milk production.

Consider, that in all these city milk producing districts there are but very few calves raised, while the cows are kept rarely more than three years.

Consider, that only one-half of all the calves are heifers and of these but a small percentage reach cowhood, that consequently the increase of cows in so great a dairy state as Wisconsin has been only $5\frac{1}{2}$ per cent. yearly from 1850 to 1900. Consider, that every child born is a consumer of milk but not always of meat.

Consider, the enormous increase in the population of this country, vastly ahead of the increase in the cow population. Consider, all these things as having a bearing on the future of the dairy industry and then tell me if you do not think there is a good prospect ahead for the farmer who will go into the business of producing and rearing first class dairy cows, bred from sires of undoubted dairy parentage.

I have a neighbor, a bright keen German dairy farmer. He buys every four or five years, the best registered Guernsey bull calf he can find to replace his old bull in a year or so. He pays handsome prices for his bulls and he will not buy a cheap animal. Mind you his herd is nearly all grade cows. He is a fine calf raiser and sells annually from 8 to 10 prime young heifers and yearlings for from \$25 to \$40 each, and he has quick sale for all he can produce. He will tell you every time that the great factor of success with him is the high quality of the bull he keeps. Don't you think his advanced ideas pay him better than as though he had no such ideas? He lives on a rented farm of 171 acres and he gives cash receipts of the farm in butter, cream, hogs, poultry, young cattle, etc., to the amount of \$4,000 annually and he has half of it. Don't you think it pays him to practice advanced ideas of farming?

THE MATTER OF BREED.

It is a common thing to hear men say: "Pay no attention to the matter of breed in cows. What you want is a cow that will do business at the pail." That sort of talk is very superficial. The question of breed is a very important one. The farmers of Minnesota followed Prof. Shaw for years and as he told them, selected beef bred bulls to breed "dual purpose" cows for dairy work. They found at last, to their sorrow, that they were getting the losing end of the bargain. Their cows were failures as dairy animals. Hoard's Dairyman warned them against the practice, and anybody who had an understanding of the effects of breed on feed, could have told them the same. For years the farmers of Iowa have been advised the same thing. All the forces of agricultural education were put in requisition to hold them to the "dual purpose" idea. But the cows resulting from such breeding are not, as a rule, economic dairy animals.

The Iowa farmers, those of them who are looking into the thing, are finding that with such cows, they are losing more at the pail than they are making in beef. And so they are getting around. Hoard's Dairyman has for years preached this doctrine: If you want milk you must breed for it, and breed for it specifically.

Mistakes in breeding are a long time in making themselves felt. Hence the importance to every farmer that he should have correct ideas as to the principles of breeding. No wonder that he is confused when well-known teachers and breeders juggle with these principles. It is as though one said, "Twice two is either three or five just as you want it." Yes, there is a great deal in breed. We once heard a story of a "dual purpose" man who went to hire out as a teacher of a country district school. The clerk asked him a few questions among which was this: "Is the earth round or flat?" "Well," said the man, "I teaches 'em both ways, just what they want."

A great many farmers have wanted "dual purpose" cows if they could get them. They called for that kind of teaching and they got it. But it was wrong, and they are finding it out in the last analysis of real practical results, at the pail. The farmers who stayed by the dairy bred cow are winning by it. Yes! there is a good deal in breed.

I spoke of the effect of breed on feed. There is a great mystery here, that no man has solved. Here stands a bale of hay. On one side is a cow; on the other is a sheep, on the other a horse. In one

case the result is milk, in the other wool, in the other speed or draft, and the same mystery appears in the same family of animals. Twelve quarts of oats fed to J.I.C. resulted in a mile in 2:10. That was the speed product of 12 quarts of oats, provided they were fed to J.I.C. Two cows stand side by side in my barn. They are of the same breed, and both are fed the same ration. One cow takes that food and turns out two pounds of butter fat a day, the other one pound. What is that secret through which comes such a wide disparity of results? So far as we can see, it is individuality.

Now, men have seized upon these individual traits in animals. They are functional in character. By steadfast, patient work, mating agreeing individualities or functions together, after a long time they have established these traits as breed characteristics and we have the speed or draft function in horses, the milk and butter trait, or the meat producing trait in cattle, the fine wool or mutton function in sheep, and so on. A great variety of ruling traits have been established. But it is very slow work. Nature yields but reluctantly to any and all modifications of structure and specific purpose.

The modern dairy cow, as has been well said, is an artificial product. She is greatly needed in the sharp, close economy of our farming work because of the greatly increasing demand for her product. This modern dairy cow is not a rascal. She must be given the care, surroundings or environment, and feed suitable to her artificial nature, if you expect the results she is capable of giving.

Then comes this everlasting proposition of farm economics, reducing the cost of production. When I turn to those two cows, one giving me twice the product for the same cost of food that the other does, I naturally inquire how this comes. Now when I find that the first cow comes down from a better line of producing ancestors than the other, it is apt to impress me with the idea that there is something in breeding, not everything, but something.

Now, all there is to this question of breeding for specific qualities or traits, is the attempt to establish as a breed characteristic, that which originally existed as an individual characteristic. So after a long time, we have the Holstein cow with her peculiar traits, bred into her for a thousand years; the Ayrshire with hers, the Jersey and the Guernsey with theirs. If you study her you will find that Nature does her best work in straight lines, and in obedience to single purposes. If you attempt to make her construct a combined speed and draft horse, or a combined milk and beef cow, she tells you at once that the structural type of form of each is different owing to the demand of differing functions, the same as the difference in form of the sewing machine and the mowing machine.

She tells you also that established prepotencies of hereditary, one opposing the other, cannot be mated and combined to the establishment of a third prepotency partaking of the nature of both.

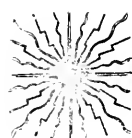
She tells you further, that such a forced combination results in a conflict of prepotencies and no wise breeder will set Nature to fighting herself. Our "dual purpose" friends have made one serious mistake. They have based their theory too much on the sporadic or occasional appearance of some most excellent cow here and there

in their ranks. They have gone on building the beefiest bulls they could produce, paying no attention to the laws of dairy form and function, and expecting profitable milk results from such a contradictory combination.

I have asked for years this question: "Where are the Shorthorn bulls, for instance, that show in their form and outline, a milk heredity, or that can be depended on to breed with any profitable certainty for milk production? This ignoring almost altogether the male line of descent, all the time breeding from the beefiest of beef heredity, and then talking about 'a milking strain' is unscientific, impracticable, and as the old Yankee said 'insensible.' "



APPENDIX.



APPENDIX.

LIST OF PUBLICATIONS OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

ANNUAL REPORTS.

- *Report of the State Board of Agriculture, 336 pages, 1877.
- *Report of the State Board of Agriculture, 625 pages, 1878.
- *Report of the State Board of Agriculture, 560 pages, 1879.
- *Report of the State Board of Agriculture, 557 pages, 1880.
- *Report of the State Board of Agriculture, 646 pages, 1881.
- *Report of the State Board of Agriculture, 645 pages, 1882.
- *Report of the State Board of Agriculture, 645 pages, 1883.
- *Report of the State Board of Agriculture, 648 pages, 1884.
- *Report of the State Board of Agriculture, 645 pages, 1885.
- *Report of the State Board of Agriculture, 646 pages, 1886.
- *Report of the State Board of Agriculture, 650 pages, 1887.
- *Report of the State Board of Agriculture, 648 pages, 1888.
- *Report of the State Board of Agriculture, 650 pages, 1889.
- *Report of the State Board of Agriculture, 594 pages, 1890.
- *Report of the State Board of Agriculture, 600 pages, 1891.
- *Report of the State Board of Agriculture, 640 pages, 1892.
- *Report of the State Board of Agriculture, 713 pages, 1893.
- *Report of the State Board of Agriculture, 646 pages, 1894.
- *Report of the Department of Agriculture, 878 pages, 1895.
- *Report of the Department of Agriculture, Part 1, 820 pages, 1896.
- *Report of the Department of Agriculture, Part 2, 444 pages, 1896.
- *Report of the Department of Agriculture, Part 1, 897 pages, 1897.
- *Report of the Department of Agriculture, Part 2, 309 pages, 1897.
- *Report of the Department of Agriculture, 894 pages, 1898.
- *Report of the Department of Agriculture, Part 1, 1682 pages, 1899.
- *Report of the Department of Agriculture, Part 2, 368 pages, 1899.
- *Report of the Department of Agriculture, Part 1, 1040 pages, 1900.
- *Report of the Department of Agriculture, Part 2, 348 pages, 1900.
- *Report of the Department of Agriculture, Part 1, 1040 pages, 1901.
- *Report of the Department of Agriculture, Part 2, 464 pages, 1901.

*Note.—Edition exhausted.

- *Report of the Department of Agriculture, Part 1, 1030 pages, 1902.
- *Report of the Department of Agriculture, Part 2, 324 pages, 1902.
- Report of the Department of Agriculture, 958 pages, 1903.
- Report of the Department of Agriculture, 790 pages, 1904.
- Report of the Department of Agriculture, 846 pages, 1905.
- Report of the Department of Agriculture, 690 pages, 1905.

BULLETINS.

- No. 1.* Tabulated Analyses of Commercial Fertilizers, 24 pages, 1895.
- No. 2.* List of Lecturers of Farmers' Institutes, 36 pages, 1895.
- No. 3.* The Pure Food Question in Pennsylvania, 38 pages, 1895.
- No. 4.* Tabulated Analyses of Commercial Fertilizers, 22 pages, 1896.
- No. 5.* Tabulated Analyses of Commercial Fertilizers, 38 pages, 1896.
- No. 6.* Taxidermy; how to collect Skins, etc., 128 pages, 1896.
- No. 7.* List of Creameries in Pennsylvania, 68 pages, 1896.
- No. 8.* Report of State Horticultural Association, 108 pages, 1896.
- No. 9.* Report of Dairymen's Association, 96 pages, 1896.
- No. 10.* Prepared Food for Invalids and Infants, 12 pages, 1896.
- No. 11.* Tabulated Analyses of Commercial Fertilizers, 22 pages, 1896.
- No. 12.* Road Laws for Pennsylvania, 42 pages, 1896.
- No. 13.* Report of Butter Colors, 8 pages, 1896.
- No. 14.* Farmers' Institutes in Pennsylvania, 92 pages, 1896.
- No. 15.* Good Roads for Pennsylvania, 42 pages, 1896.
- No. 16.* Dairy Feeding as Practiced in Pennsylvania, 126 pages, 1896.
- No. 17.* Diseases and Enemies of Poultry, 128 pages, 1896.
- No. 18.* Digest of the General and Special Road Laws for Pennsylvania, 130 pages, 1896.
- No. 19.* Tabulated Analyses of Commercial Fertilizers, 40 pages, 1896.
- No. 20.* Preliminary Report of Secretary, 126 pages, 1896.
- No. 21.* The Township High School, 24 pages, 1897.
- No. 22.* Cider Vinegar of Pennsylvania, 28 pages, 1897.
- No. 23.* Tabulated Analyses of Commercial Fertilizers, 31 pages, 1897.
- No. 24.* Pure Food and Dairy Laws of Pennsylvania, 19 pages, 1897.
- No. 25.* Farmers' Institutes in Pennsylvania, 8 pages, 1897.
- No. 26.* Farmers' Institutes in Pennsylvania, 74 pages, 1897.
- No. 27.* The Cultivation of American Ginseng, 23 pages, 1897.
- No. 28.* The Fungous Foes of the Farmer, 19 pages, 1897.
- No. 29.* Investigations in the Bark of Trees, 17 pages, 1897.

- No. 30.* Sex in Plants, 17 pages, 1897.
- No. 31.* The Economic Side of the Mole, 42 pages, 1898.
- No. 32.* Pure Food and Dairy Laws, 30 pages, 1898.
- No. 33.* Tabulated Analyses of Commercial Fertilizers, 42 pages, 1898.
- No. 34.* Preliminary Report of the Secretary, 150 pages, 1898.
- No. 35.* Veterinary Medicines, 23 pages, 1898.
- No. 36.* Constitutions and By-Laws, 72 pages, 1898.
- No. 37.* Tabulated Analyses of Commercial Fertilizers, 40 pages, 1898.
- No. 38.* Farmers' Institutes in Pennsylvania, 8 pages, 1898.
- No. 39.* Farmers' Institutes in Pennsylvania, 88 pages, 1898.
- No. 40.* Questions and Answers, 206 pages, 1898.
- No. 41.* Preliminary Reports of the Department, 189 pages, 1899.
- No. 42.* List of Creameries in Pennsylvania, 88 pages, 1899.
- No. 43.* The San José and other Scale Insects, 22 pages, 1899.
- No. 44.* Tabulated Analyses of Commercial Fertilizers, 62 pages, 1899.
- No. 45.* Some Harmful Household Insects, 13 pages, 1899.
- No.* 46. Some Insects Injurious to Wheat, 24 pages, 1899.
- No. 47.* Some Insects Attacking Fruit, etc., 19 pages, 1899.
- No. 48.* Common Cabbage Insects, 14 pages, 1899.
- No. 49.* Methods of Protecting Crops, etc., 20 pages, 1899.
- No. 50.* Pure Food and Dairy Laws of Pennsylvania, 33 pages, 1899.
- No. 51.* Tabulated Analyses of Commercial Fertilizers, 69 pages, 1899.
- No. 52.* Proceedings Spring Meeting of Round-up Meeting, Farmers' Institute Managers, etc., 296 pages, 1899.
- No. 53.* Farmers' Institutes in Pennsylvania, 1899-1900, 94 pages 1899.
- No. 54.* Tabulated Analyses of Commercial Fertilizers, 163 pages, 1899.
- No. 55.* The Composition and Use of Fertilizers, 126 pages, 1899.
- No. 56. Nursery Fumigation and the Construction and Management of the Fumigating House, 24 pages, 1899.
- No. 57. The Application of Acetylene Illumination to Country Homes, 85 pages, 1899.
- No. 58. The Chemical study of the Apple and Its Products, 44 pages, 1899.
- No. 59. Fungous Foes of Vegetable Fruits, 39 pages, 1899.
- No. 60.* List of Creameries in Pennsylvania, 33 pages, 1899.
- No. 61.* The Use of Lime in Pennsylvania Soils, 170 pages, 1900.
- No. 62. A Summer's Work Abroad in School Grounds, Home Grounds, Play Grounds, Parks and Forests, 34 pages, 1900.
- No. 63. A Course in Nature Study for Use in the Public Schools, 119 pages, 1900.
- No. 64. Nature Study Reference Library for Use in the Public Schools, 22 pages, 1900.
- No. 65. Farmers' Library List, 29 pages, 1900.
- No. 66.* Pennsylvania Road Statistics, 98 pages, 1900.
- No. 67. Methods of Steer Feeding, 14 pages, 1900.

- No. 68.* Farmers' Institutes in Pennsylvania, 90 pages, 1900.
- No. 69.* Road Making Materials of Pennsylvania, 104 pages, 1900.
- No. 70.* Tabulated Analyses of Commercial Fertilizers, 97 pages, 1900.
- No. 71. Consolidation of Country Schools and the Transportation of Scholars by Use of Vans, 89 pages, 1900.
- No. 72.* Tabulated Analyses of Commercial Fertilizers, 170 pages, 1900.
- No. 73. Synopsis of the Tax Laws of Pennsylvania, 132 pages, 1901.
- No. 74.* The Repression of Tuberculosis of Cattle by Sanitation, 24 pages, 1901.
- No. 75.* Tuberculosis of Cattle, and the Pennsylvania Plan for its Repression, 262 pages, 1901.
- No. 76. A Co-operative Investigation into the Agricultural Seed Supply of Pennsylvania, 50 pages, 1901.
- No. 77.* Bee Culture, 101 pages, 1901.
- No. 78.* List of County and Local Agricultural Societies, 10 pages, 1901.
- No. 79. Rabies, 28 pages, 1901.
- No. 80.* Decisions of the Department of Agriculture on the Pure Food Act of 1895, 20 pages, 1901.
- No. 81.* Concentrated Commercial Feeding Stuffs in Pennsylvania, 136 pages, 1901.
- No. 82.* Containing the Law Creating a Department of Agriculture in Pennsylvania, and Giving the Various Acts of Assembly Committed to the Department for Enforcement; Together with Decisions and Standards Adopted with Reference to the Pure Food Act of 1895, 99 pages, 1901.
- No. 83.* Tabulated Analyses of Commercial Fertilizers, 132 pages, 1901.
- No. 84. Methods of Steer Feeding; the Second Year of Co-operative Experiment by the Pennsylvania State Department of Agriculture and the Pennsylvania State College Agricultural Experiment Station, 16 pages, 1901.
- No. 85.* Farmers' Institutes of Pennsylvania, 102 pages, 1901.
- No. 86.* Containing a Complete List of Licenses granted by the Dairy and Food Commissioner, from January 1, 1901, to July 1, 1901, etc., 422 pages, 1901.
- No. 87.* Giving Average Composition of Feeding Stuffs, 42 pages, 1901.
- No. 88.* List of Creameries in Pennsylvania, 33 pages, 1901.
- No. 89.* Tabulated Analyses of Commercial Fertilizers, 195 pages, 1901.
- No. 90. Treatment of San José Scale in Orchard and Nursery, 33 pages, 1902.
- No. 91. Canning of Fruits and Vegetables, 57 pages, 1902.
- No. 92.* List of Licenses Granted by the Dairy and Food Commissioner, 193 pages, 1902.
- No. 93. The Fundamentals of Spraying, 35 pages, 1902.

No. 94. Phosphates—Phosphatic or Phosphoric Acid Fertilizers, 87 pages, 1902.

No. 95.* County and Local Agricultural Societies, 1902, 12 pages, 1902.

No. 96. Insects Injurious to Cucurbitaceous Plants, 31 pages, 1902.

No. 97. The Management of Greenhouses, 41 pages, 1902.

No. 98. Bacteria of the Soil in their Relation to Agriculture, 88 pages, 1902.

No. 99. Some Common Insect Pests of the Farmer, 32 pages, 1902.

No. 100.* Containing Statement of Work of Dairy and Food Division from January 1, 1902, to June 30, 1902, 223 pages, 1902.

No. 101.* Tabulated Analyses of Commercial Fertilizers, 137 pages, 1902.

No. 102. The Natural Improvement of Soils, 50 pages, 1902.

No. 103.* List of Farmers' Institutes of Pennsylvania, 67 pages, 1902.

No. 104. Modern Dairy Science and Practice, 127 pages, 1902.

No. 105.* Potato Culture, 9 pages, 1902.

No. 106. The Varieties of Fruit that can be Profitably Grown in Pennsylvania, 50 pages, 1902.

No. 107. Analyses of Concentrated Commercial Feed Stuffs, 62 pages, 1903.

No. 108. The Hessian Fly in Pennsylvania. — 1903 (Never printed.)

No. 109.* Tabulated Analyses of Commercial Fertilizers 208 pages, 1903.

No. 110.* Containing Statement of Work of Dairy and Food Division from July 1, to December 31, 1902, 248 pages, 1903.

No. 111. Small Fruits, their Origin, Culture and Marketing, 66 pages, 1903.

No. 112.* List of County and Local Agricultural Societies, 10 pages, 1903.

No. 113. Methods of Milking, 96 pages, 1903.

No. 114.* Tabulated Analyses of Commercial Fertilizers, 116 pages, 1903.

No. 115. Proceedings of Annual Meeting of Farmers' Institute Managers and Lecturers, 210 pages, 1903.

No. 116* Farmers Institutes in Pennsylvania, Season 1903-1904, 64 pages, 1903.

No. 117. Potash Fertilizers—Sources and Methods of Application, 46 pages, 1903.

No. 118.* Containing the Laws Creating the Office of Dairy and Food Commissioner in Pennsylvania, and also a Digest of the Acts of Assembly Committed to his Administration, 62 pages, 1903.

No. 119.* Tabulated Analyses of Commercial Fertilizers, 115 pages, 1903.

No. 120. The Apple-tree Tent-caterpillar, 46 pages, 1903.

No. 121. Address of Hon. Joseph W. Hunter, State Highway Commissioner, Delivered at Annual Meeting of State Board of Agriculture, January 28, 1904, 16 pages, 1903.

*Note.—Edition exhausted.

No. 122.* Analyses of Concentrated Commercial Feeding Stuffs, 52 pages, 1904.

No. 123. Chestnut Culture, 50 pages, 1904.

No. 124.* County and Local Agricultural Fairs, 10 pages, 1904.

No. 125. The Source and Nature of Bacteria in Milk, 41 pages, 1904.

No. 126.* Tabulated Analyses of Commercial Fertilizers, January 1, to August 1, 140 pages, 1904.

No. 127.* Farmers' Institutes in Pennsylvania, 71 pages, 1904.

No. 128. Grape Culture, 62 pages, 1904.

No. 129. Alfalfa Culture in Humid Land, 64 pages, 1904.

No. 130. The Cow-pea in the North, 41 pages, 1904.

No. 131. Proceedings, State Board of Agriculture and Farmers' Normal Institute, 260 pages, 1904.

No. 132.* Analyses of Commercial Fertilizers, August 1, to December 31, 70 pages, 1904.

No. 133. The Improvement of Corn in Pennsylvania, 76 pages, 1904.

No. 134. Proceedings of the Twenty-eighth Annual Meeting of the State Board of Agriculture, 152 pages, 1905.

No. 135. Analyses of Concentrated Feeding Stuffs, 41 pages, 1905.

No. 136.* List of County and Local Agricultural Societies, 8 pages, 1905.

No. 137. Proceedings, Spring Meeting State Board of Agriculture and Farmers' Annual Normal Institute, 216 pages, 1905.

No. 138.* Analyses Concentrated Commercial Fertilizers, January 1, to August 1, 106 pages, 1905.

No. 139.* Farmers' Institutes in Pennsylvania, 1905-1906, 93 pages, 1905.

No. 140. Sheep Husbandry, 69 pages, 1905.

No. 141. Laws Relating to the Dairy and Food Division, 47 pages, 1905.

No. 142.* Analyses Concentrated Commercial Fertilizers, August 1, to December 31, 61 pages, 1905.

No. 143. Poultry in Pennsylvania, 36 pages, 1906.

No. 144. Proceedings of 29th Annual Meeting State Board of Agriculture, 191 pages, 1906.

No. 145. Commercial Feeding Stuffs in Pennsylvania, 51 pages, 1906.

No. 146. List of County and Local Agricultural Societies, 10 pages, 1906.

No. 147. Market Gardening, 53 pages, 1906.

No. 148. Report of the Bee-Keepers Association of Penna., 57 pages, 1906.

No. 149. Analyses Commercial Fertilizers January 1-August 1, '06. 80 pages, 1906.

No. 150. Farmers' Institutes in Penna., for year 1906-1907, 73 pages, 1906.

No. 151. Proceedings Spring Meeting of State Board of Agriculture and Farmers' Annual Normal Institute, 190 pages, 1906.

No. 152. Fruit for Pennsylvania, 330 pages, 1906.

No. 153. Analyses Commercial Fertilizers August 1-December 31, 1906, 60 pages, 1906.

FERTILIZER VALUATIONS—1906.

The object of an official valuation of commercial fertilizers is to enable the consumer to judge approximately whether he has been asked to pay for a given brand more than the fertilizing ingredients it contains and market conditions prevailing at the time would warrant. It is clear, therefore, that no attempt is made in this valuation to indicate whether the fertilizer valued possesses a greater or less crop-producing capacity than another fertilizer; but only whether it is higher priced than another of the same general composition.

For this purpose it must be so computed as to include all the elements entering into the cost of a fertilizer as it is delivered to the consumer. These elements may be conveniently grouped as follows:

1. The wholesale cost of the ingredients.
2. The jobbers' gross profit on the sale of the ingredients; this includes office expenses, advertising, losses, etc.; for the purpose of the present computation it may be assumed that the sum of this gross profit and the wholesale cost of the ingredients is equivalent to the retail price of the single ingredients near the wholesale markets in ton lots of original packages for cash.
3. The expense and profit of mixing: This item applies only to complete fertilizers, rock and potash, and ammoniated rock; not to dissolved or ground bone, or to dissolved rock.
4. The expense and profit of bagging.
5. Agents' commission: This item includes not only the commission proper, but every advance in price due to the sale of the goods through an agent in small quantities on time, rather than directly to the consumer in ton lots for cash.
6. Freight from the wholesale market to the point of delivery.

The valuations for 1905 were based:

1. Upon the wholesale prices from September 1, 1904, to March 1, 1905, of the raw materials used in fertilizer manufacture, the quotations of the New York market being adopted for all materials except acidulated phosphate rock and ground bone.

2. Upon an allowance of 20 per cent. of the wholesale prices, above mentioned, to cover jobbers' profit.

By adding the 20 per cent. allowed for jobbers' gross profit to the wholesale price of the several raw materials, the retail price in original packages at the jobbers' warehouse is obtained.

Since the amount of the several valuable fertilizing constituents in the various raw materials is known, it is a simple matter to determine the corresponding retail value per pound of the valuable fertilizing constituents yielded by each raw material. A schedule of these pound values affords a convenient basis of computation of the value per ton of various fertilizers, whose composition is ascertained by analysis.

The values assigned, for the present, to the other elements in the cost of the fertilizer at the point of a delivery are:

3. For mixing, \$1.00 per ton.
4. For bagging, \$1.00 per ton, in all cases except those in which the article was sold in original packages; the cost of the package being, in such cases, included in the wholesale price.
5. For agents' commissions, 20 per cent. of the cost of the goods f. o. b. at the jobbers' or mixers' warehouse.
6. For freight, \$2.00 per ton; the cost of the freight in lots of twelve tons or over, from the seaboard to Harrisburg, averaging \$1.88 per ton.

The following valuation of dissolved South Carolina rock illustrates the method:

Phosphoric acid.	Per cent.	Weight per ton.	
Soluble,	11.50	230 lbs. at 3c.	\$6 90
Reverted,	2.50	50 lbs. at 2½c.	1 25
Insoluble,	1.00	20 lbs. at 1½c.	30
			<hr/>
Retail cash value of ingredients,			\$8 45
Bagging,			1 00
			<hr/>
Cash value of goods ready for shipment,			\$9 45
Agents' commission, 20 per cent.,			1 89
Freight,			2 00
			<hr/>
Commercial value per ton,			\$13 34
			<hr/> <hr/>

It is not to be expected, of course, that the valuations thus computed will precisely represent the fair price to be charged for a brand in each locality and in every transaction. Market conditions, competition, distance from factory, all introduce minor variations. Nevertheless, to make the approximation reasonably close the average valuation of a given class of goods ought to agree closely with its ascertained average selling price. Whenever such an agreement is no longer obtained by the use of a schedule, it is evident that the schedule of retail values of the constituents, or the added allowances for mixing, etc., requires revision.

It is needful to note here another factor greatly affecting the practical accuracy of these approximations. Their computation would offer little difficulty and their usefulness be far greater, if, by the ordinary methods of analysis, the exact nature of the ingredients used to supply the several fertilizer constituents, were capable of certain determination. This is, however, possible, to-day, to only a limited extent. The valuations are, therefore based on the assumption that the fertilizers are uniformly compounded from high quality ingredients, such as are commonly employed in the manufacture of fertilizers of the several classes. Consumers should carefully avoid the error of accepting such valuations as infallible; they are not designed to be used for close comparisons of single brands, but only to indicate whether the price asked for a fertilizer is abnormal, assuming good quality for the ingredients used. From this it is clear that, except as high freights may require, the selling price of a brand should not exceed the valuation; but that a fertilizer may be made of inferior materials and yet have a high valuation.

The valuations used during 1904 were modified for use during 1905 in accordance with the changes in wholesale prices of fertilizing ingredients and to make the valuations more closely follow the selling price.

The following comparative statement shows the valuations and selling prices of the several classes of fertilizers during 1901 to 1905:

Fertilizers.	Number of samples.	Valuation.	Selling price.	Difference of valuation from selling price.
Spring, 1901.				
Complete,	291	24.76	23.92	0.84
Rock-and-potash,	60	14.60	16.20	-1.60
Dissolved bone,	1	29.00	28.00	1.00
Ground bone,	44	28.71	27.50	1.12
Dissolved rock,	49	13.51	13.90	-0.39
Fall, 1901.				
Complete,	179	23.75	22.28	1.47
Rock-and-potash,	42	14.23	16.09	-1.86
Dissolved bone,	5	23.36	23.91	-0.55
Ground bone,	33	27.69	25.94	1.75
Dissolved rock,	40	13.82	13.18	0.64
Spring, 1902.				
Complete,	289	25.33	24.10	1.23
Rock-and-potash,	66	15.05	16.45	-1.40
Dissolved bone,	2	17.35	16.70	0.65
Ground bone,	29	26.89	28.52	-1.72
Dissolved rock,	59	13.49	13.73	-0.24
Fall, 1902.				
Complete,	229	23.31	21.83	1.48
Rock-and-potash,	62	14.46	15.98	-1.52
Dissolved bone,	6	27.68	25.30	2.38
Ground bone,	27	27.51	28.09	-0.58
Dissolved rock,	56	13.70	13.47	0.23
Spring, 1903.				
Complete,	335	21.59	21.57	0.02
Rock-and-potash,	82	14.73	17.20	-2.47
Dissolved bone,	3	30.87	31.17	-0.30
Ground bone,	27	27.35	28.67	-1.32
Dissolved rock,	56	12.24	15.13	-2.89
Fall, 1903.				
Complete,	264	22.77	21.98	0.79
Rock-and-potash,	74	14.86	15.96	-1.10
Dissolved bone,	11	21.57	23.67	-2.10
Ground bone,	43	27.07	27.52	-0.45
Dissolved rock,	60	13.12	14.64	-1.52
Spring, 1904.				
Complete,	349	25.07	24.28	0.79
Rock-and-potash,	75	15.45	16.47	-1.02
Dissolved bone,	2	28.42	31.70	-3.28
Ground bone,	22	27.77	28.20	-0.43
Dissolved rock,	41	14.06	14.59	-0.53
Fall, 1904.				
Complete,	256	22.53	21.82	0.71
Rock-and-potash,	68	14.92	15.89	-0.97
Dissolved bone,	6	27.77	24.94	2.83
Ground bone,	38	27.97	27.62	0.35
Dissolved rock,	45	14.09	13.89	0.20
Spring, 1905.				
Complete,	374	25.60	24.63	0.97
Rock-and-potash,	82	17.49	16.11	1.38
Dissolved bone,	3	22.50	23.83	-1.33
Ground bone,	27	26.72	26.68	0.04
Dissolved rock,	47	13.88	13.64	0.24
Fall, 1905.				
Complete,	285	22.35	21.39	0.96
Rock-and-potash,	74	15.94	15.97	-0.03
Dissolved bone,	6	25.85	24.78	1.07
Ground bone,	35	28.70	27.70	1.00
Dissolved rock,	49	13.51	12.21	1.30

The general tendencies of the wholesale market may be judged from the following comparative statement, obtained from the weekly reports of the Oil, Paint and Drug Reporter, of New York City, showing the average wholesale prices of fertilizer raw materials from September 1, 1904 to March 1, 1905, and from September 1, 1905, to March 1, 1906.

Wholesale Prices of Fertilizer Ingredients, New York, Oil, Paint and Drug Reporter.

Substance.	Amount priced.	Average price September 1, 1904, to March, 1905.	Average price September 1, 1905, to March, 1906.	Prices September 1905-March, 1906, in per cent. of prices, 1904-5.
Sulphate of ammonia,	Cwt.,	3.1367	3.1253	99.6
Nitrate of soda,	Cwt.,	12.3116	12.2978	96.4
Dried blood, H. G.,	Unit (20 lbs.),	12.5933	12.6388	102.3
Concentrated tankage,	Unit (20 lbs.),	12.3376	12.2161	94.8
Rough bone,	Ton,	16.25	15.96	98.3
Bone meal,	Ton,	22.875	22.57	98.7
Fish guano, dry,	Unit (20 lbs.),	*2.543	*2.5536	100.4
Fish guano, acid,	Unit (20 lbs.),	12.29	12.331	106.0
Refuse bone black, oil,	Ton,	13.65	14.00	102.6
Refuse bone black, sugar,	Ton, .....	.....	18.00	.....
Phosphate rock, Charleston,	Ton,	6.00	5.125	85.4
Phosphate rock, Tennessee,	Ton,	3.75	3.87	103.2
Acid phosphate,	Unit (20 lbs.),	1.6375	1.6375	100.0
Double manure salts,	Cwt.,	1.134	1.18	104.0
Sulphate of potash,	Cwt.,	2.1288	2.20	103.3
Kainit,	Ton,	9.21	8.50	92.3
Muriate of potash,	Cwt.,	1.9006	1.965	103.4
Sulphuric acid, 66 Deg. B.,	Cwt.,	1.346	1.20	89.2

*Bone phosphate of lime 10 cents per unit.

†Bone phosphate of lime 35 cents per unit.

In ammoniates such as dried blood and fish guano, the unit is of ammonia, of which 82.35 per cent. is nitrogen; in acid phosphates, the unit is of phosphoric acid (phosphorus pentoxid).

With the exception of dried blood and fish guano which have advanced in price, the nitrogenous materials show a decrease from last year's prices.

The most marked changes occur in case of concentrated tankage and nitrate of soda.

The following data are from the monthly reports of Thos. J. White & Co., fertilizer brokers, Baltimore, Md., giving wholesale quotations upon ammoniates.

Wholesale Prices of Ammoniates: Reports of Thos. J. White & Co., Baltimore, Md.

	Prices September to March, 1904-5.	Prices September to March, 1905-6.
Sulphate of ammonia, per cwt.,	3.1208	3.125
Nitrate of soda,	2.2896	2.204
Ground blood, f. o. b. Chicago, per unit of ammonia,	2.2842	2.4893
Concentrated tankage, f. o. b. Chicago, per unit of ammonia,	2.3416	2.3125
Crushed tankage c. a. f. Baltimore, per unit ammonia:		
9 per cent. ammonia, 20 per cent. bone phosphate,	2.575	*2.6125
Unground tankage f. o. b. Chicago, per unit of ammonia:		
9 per cent. ammonia, 20 per cent. bone phosphate,	*2.17	*2.10
Ground tankage f. o. b. Chicago, per unit of ammonia:		
11 per cent. ammonia, 15 per cent. bone phosphate,	2.275	†2.312
10 per cent. ammonia, 20 per cent. bone phosphate,	2.25	†2.25
8 per cent. ammonia, 30 per cent. bone phosphate,		†2.15
Hoof meal f. o. b. Chicago, per unit of ammonia,	2.4225	‡2.45

*September quotations lacking.

†Bone phosphate of lime 10 cents.

‡September and October quotations only.

§September, February and March quotations.

New York wholesale quotations for acid phosphate, per unit of available phosphoric acid, remained the same as last year.

Quotations from the Journal of Commerce issue a value of \$.318 per lb. of available phosphoric acid which is also unchanged from 1905.

Early this year acid phosphate was quoted to inquirers in Rhode Island, Connecticut, Massachusetts and New Jersey at about the same retail price as last year.

Potash Salts:—The reports of the U. S. Bureau of Statistics show the following entries for consumption during the fiscal year 1904 and 1905.

	1904.	1905.
Muriate (pounds),	161,503,735	202,306,601
Kies-rit, kainit, etc.,	158,384	240,789

This trade is so managed that by March nearly all wholesale deliveries of the year are contracted for. The prices for potashes for 1905 as announced by the German Potash Syndicate show no changes from last years quotations. The schedule of prices on the basis of large lots sold through brokers and delivered at Boston, New York or Philadelphia, is as follows:

Salt.	March, 1905.	After March, 1905.
Muriate, 80 per cent., per 100 lbs.,	1.885	1.915
Sulphate, 48 per cent. potash, per 100 lbs.,	12.17	12.20
Double manure salt, 48-50 per cent., per 100 lbs.,	2.17	2.20
Kainit, 12.4 per cent., actual potash, per ton,	8.25	8.50
Manure salt, 20 per cent. potash, per ton,	14.68	15.08

Composition of Raw Materials.—In order to form a correct idea of the cost per pound of the fertilizer constituents of these materials, it is needful to determine their composition or, in other words, the quantities of valuable constituents each contain. The following table shows the composition of the raw materials used in the manufacture of fertilizers. No analyses of these materials, with the exception of ground bone and dissolved rock, have been made in Pennsylvania. The figures in the following table include the averages of the results of analyses made in Connecticut, New Jersey and Massachusetts during the past year, except in the case of ground bone and dissolved rock phosphates, where Pennsylvania results alone are included.

Composition of Non-Acidulated Fertilizer Ingredients. (Per cent.)

	Number of samples analyzed.	Nitrogen.	Potash.	Total phosphoric acid.
Sulphate of ammonia,	1	20.42	.....	.....
Nitrate of soda,	28	15.55	.....	.....
Dried blood,	12	19.37	.....	.....
Ground bone,	62	3.12	.....	28.78
Tankage,	14	6.13	.....	14.46
Ground fish,	11	8.29	.....	7.62
Cotton seed meal,	157	7.03	1.90	3.15
Castor pomace,	4	4.70	1.00	1.90
Sulphate of potash, H. G.,	6	.....	49.06	.....
Muriate of potash,	16	.....	51.23	.....
Kainit,	1	.....	12.49	.....
Double sulphate of potash and magnesia,	7	.....	26.68	.....

Composition of Acidulated Fertilizer Ingredients. (Per cent.)

	Number of samples analyzed.	Total phosphoric acid.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.
Dissolved bone-black,	3	16.74	11.95	3.06	1.73
Dissolved bone,*	9	14.60	4.37	5.92	4.42
Dissolved rock phosphate,	96	15.86	9.75	4.75	1.36

*Also contains 1.90 per cent. nitrogen.

Cost per pound of Fertilizer Constituents.—With the composition of these raw materials and their price per ton, hundred weight, or other unit of measure as a basis, the wholesale cost per pound of the valuable constituents can be readily calculated. In many cases the ammoniates are quoted “per unit of ammonia,” the term unit being equivalent to per cent.; in goods sold by the ton of 2,000lbs., the unit is equal to 20lbs., and 20lbs. of ammonia contain 16.47lbs. of nitrogen.

In the case of refuse bone-black, unacidulated, the mean, 28.25 per cent. of phosphoric acid, is assumed to represent the average material on the market.

Phosphate rock is sold by the ton of 2,240lbs., and on the basis of the bone phosphate of lime it contains, with drawbacks for injurious constituents. Bone-phosphate of lime contains 455.8 per cent. of phosphoric acid; therefore, each per cent. of bone phosphate in a long ton is equivalent of 22.4 lbs. and contains 10.26 lbs. of phosphoric acid.

In the wholesale trade, dried blood, azotine, concentrated tankage and hoof meals are usually sold on the basis of ammonia, disregarding the phosphoric acid present.

Insoluble phosphoric acid in dissolved rock is likewise omitted from consideration, contracts being based solely upon the “available” phosphoric acid; nor in rock phosphates is any claim made for the small quantities of nitrogen and potash they contain, nor in dissolved bone for the potash present.

Under these conditions, the wholesale cost per pound in New York of the valuable constituents of such materials as furnish but a single fertilizing element, these materials being assumed to be in the state of preparation and in the packing in which the manufacturer purchased them, are given in the following table; also a figure representing a fair retail price at the factory, the materials having undergone no change in treatment or packing and the allowance for expenses and profit in retailing being 20 per cent.

Wholesale Cost Per Pound of Fertilizer Constituents. (New York.)

I. Ingredients Supplying One Constituent.

Material.	Constituent valued.	Wholesale price—Cents.	Wholesale price plus 20 per cent.
Sulphate of ammonia,	Nitrogen,	15.30	18.63
Nitrate of soda,	Nitrogen,	14.33	17.20
Dried blood, high grade,	Nitrogen,	16.11	19.33
Concentrated tankage,	Nitrogen,	13.43	16.12
Refuse bone black:			
Oil,	Phosphoric acid, total,	2.48	2.99
Sugar,	Phosphoric acid, total,	3.19	3.83
Phosphate rock,*			
Tennessee, 78 per cent.,	Phosphoric acid, total, ....	.515	.618
South Carolina, 60 per cent.,	Phosphoric acid, total, ....	.670	.804
Acid phosphate,	Phosphoric acid available, ..	3.19	3.83
Double manure salts,	Potash,	4.43	5.32
Sulphate of potash,	Potash,	4.52	5.42
Muriate of potash,	Potash,	3.75	4.50
Kainit,	Potash,	2.97	3.56

*The prices of phosphate rock are f. o. b. at the respective points of shipment, not New York, and are taken from the reports of the Engineering and Mining Journal. The prices for potash are taken from the schedule of the syndicate. The prices for concentrated tankage are taken from the reports of Thos. J. White & Co., and those of the remainder from the Oil, Paint and Drug Reporter.

The quotations for bone are given without specific reference to quality, so that it is impossible from these data to fairly apportion their several wholesale values to the nitrogen and phosphoric acid contained in this material. As compared with tankage, the general tendency is to assign a higher commercial rating to the phosphoric acid in bone and to the nitrogen a rating not very different from that given in tankage. The quotations of Thos. J. White & Co. show an average wholesale rate in Baltimore during September, 1904, to March, 1905, for crushed tankage to have been 2.6125 per unit of ammonia and \$0.10 per unit of bone phosphate of lime. This is equivalent to \$3.17 per unit of nitrogen and \$.218 per unit of phosphoric acid. The average composition of the ground bone and bone meal samples analyzed last fall in Pennsylvania was: Phosphoric acid, 22.59 per cent.; nitrogen, 2.96 per cent. The prepared bone contains less fat and moisture and often less nitrogen than the ordinary "rough bone," but these differences tend, in a manner, to neutralize each other.

Assuming for the rough bone quoted in the New York market the same composition as the bone meal sold in Pennsylvania and for the value of the nitrogen \$3.17 per unit, the values per pound of the several constituents would be:

Wholesale Cost per Pound of Fertilizer Constituents, New York. II. Bone.

	Constituent valued.	Wholesale price.	Wholesale price plus 20 per cent.
Rough bone,	Nitrogen,	15.85	19.02
	Phosphoric acid,	1.46	1.75
Ground bone,	Nitrogen,	22.41	26.89
	Phosphoric acid,	2.06	2.47

Valuation in Neighboring States.

It is desirable, from all points of view, that the schedules of valuation throughout a district in which similar market conditions prevail, should differ as little as possible. It has been our practice in the past, to conform our schedule to that adopted after very careful cooperative study of market conditions for each year, by the New England States and New Jersey, except where the peculiar conditions of our markets have made the valuations diverge too largely from the actual selling prices, as in the case of ground bone and dissolved rock phosphates. The schedules for these States for 1905 and 1906 are as follows:

Trade Values Adopted by the New England States and New Jersey.

	Cents per pound.		Values in 1906 in per cent. of those of 1905.
	1905.	1906.	
Nitrogen:			
In ammonia salts,	17½	17½	100
In nitrates,	17.0	16½	97.1
In dry and fine ground fish,	18½	18½	100
In meat, blood and mixed fertilizer,	18½	18½	100
In fine ground bone and tankage,	18.0	18.0	100
In coarse bone and tankage,	13.0	13.0	100
Phosphoric acid:			
Water soluble,	4½	4½	100
Citrate soluble,	4.0	*4.0	100
In cotton seed meal, castor pomace, fine ground fish and wood ashes,	4.0	4.0	100
In fine bone and tankage,	4.0	4.0	100
In coarse bone and tankage,	3.0	3.0	100
In mixed fertilizers, insoluble,	2.0	2.0	100
Potash:			
In forms free from muriate,	5.0	5.0	100
As muriate,	4½	4½	100

*Except in New Jersey, where owing to the legal requirements of methods which indicate a less quantity of citrate soluble than is obtained by use of the official method a valuation of 4½ cents per pound has been adopted.

For reasons often stated in previous reports, conditions in Pennsylvania require a separate valuation of dissolved rock and ground bone from that obtained in neighboring states. On comparing the valuations of these two classes of goods with these selling prices during the past fall, and also in consideration of the steadiness of their wholesale quotations, the 1905 rate of valuations will be continued for 1906.

Schedule of Values for Fertilizer Ingredients, 1906.

	Cents per pound.
Nitrogen:	
In ammonia salts,	17½
In nitrates,	18½
In meat, dried blood and mixed fertilizers,	18½
In cotton seed meal and castor pomace,	16½
In fine ground bone and tankage,	14
In coarse bone and tankage,	12
Phosphoric acid:	
Soluble in water, in bone fertilizers,	4½
Soluble in water, in rock fertilizers,	3
Soluble in ammonium citrate, in bone fertilizers,	4
Soluble in ammonium citrate, in rock fertilizers,	2½
Insoluble in ammonium citrate, in bone fertilizers,	2
Insoluble in ammonium citrate, in rock fertilizers,	1½
In fine bone, tankage and fish,	3
In coarse bone and tankage,	2½
In cotton seed meal, castor pomace and wood ashes,	4
Potash:	
In high grade sulphate or in forms free from muriate,	5
As muriate,	4½

Potash in excess of that equivalent to the chlorine present, will be valued as sulphate, and the remainder as muriate.

Nitrogen in mixed fertilizers will be valued as derived from the best sources of organic nitrogen, unless clear evidence to the contrary is obtained.

Phosphoric acid in mixed fertilizers is valued at bone phosphoric acid prices, unless clearly found to be derived from rock phosphate.

Bone is sifted into two grades of fineness: Fine, less than 1.50 inch in diameter; coarse, over 1.50 inch in diameter.

The result obtained by the use of this schedule does not cover the items of mixing, bagging, freight and agents' commission. To cover these, allowances are made as follows:

For freight, an allowance of \$2.00 per ton on all fertilizers.

For bagging, an allowance of \$1.00 per ton on all fertilizers, except when sold in original packages.

For mixing, an allowance of \$1.00 per ton on complete fertilizers and rock-and-potash goods.

For agents' commission, an allowance of 20 per cent. is added to the cash value of the goods ready for shipment.

FERTILIZER ANALYSES JANUARY 1, TO AUGUST 1, 1906.

Since January 1, 1906, there have been received from authorized sampling agents twelve hundred and fifty-three fertilizer samples, of which six hundred and five were subject to analysis, the remainder being rejected either because they represented brands analyzed last season, or because they were regarded as not certainly representative of the brand whose name they bore. When two or more samples representing the same brand were received equal portions from the several samples were united and the composite sample was subjected to analysis.

The samples analyzed group themselves as follows, 285 complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 6 dissolved bones furnishing phosphoric acid and nitrogen; 74 rock-and-potash fertilizers, furnishing phosphoric acid and potash; 49 acidulated rock phosphates, furnishing phosphoric acid only; 35 ground bones, furnishing phosphoric acid and nitrogen, and one miscellaneous sample, which group includes substances not properly classified under the foregoing heads.

The determinations to which a complete fertilizer is subjected are as follows: (1) Moisture, useful for the comparison of analyses, for indication of dry condition and fitness for drilling, and also of the conditions under which the fertilizer was kept in the warehouse. (2) Phosphoric acid—total, that portion soluble in water, and of the residue, that portion not soluble in warm ammonia citrate solution (a solution supposed to represent the action of plant roots upon the fertilizer), which is assumed to have little immediate food value. By difference, it is easy to compute the so-called “reverted” acid, which is the portion insoluble in water but soluble in the citrate. The sum of the soluble and reverted is commonly called the “available” phosphoric acid. (3) Potash soluble in water—most of that present in green sand marl and crushed minerals, and even some of that present in vegetable materials such as cotton-seed meal, not being included because insoluble in water even after long boiling. (4) Nitrogen—This element is determined by a method which simply accounts for all present, without distinguishing between the quantities present in the several forms of ammonium salts, nitrates or organic matter. (5) Chlorin; this determination is made to afford a basis for estimating the proportion of the potash that is present as chlorid of muriate, the cheaper source. The computation is made on the assumption that the chlorin present, unless in excess has been introduced in the form of muriate of potash; but doubtless there are occasional exceptions to this rule. One part of chlorin combines with 1.326 parts of potash to form the pure muriate; knowing the chlorin, it is, therefore, easy to compute the potash equivalent thereto. (7) In the case of ground bone, the state of subdivision is determined by sifting through accurately made sieves; the cost of preparation and especially the promptness of action of bone in the soil depends very largely on the fineness of its particles the finer being much more quickly useful to the plant.

The law having required the manufacturer to guarantee the amount of certain valuable ingredients present in any brand he may put upon the market, chemical analysis is employed to verify the guaranties stamped upon the fertilizer sacks. It has, therefore, been deemed desirable in this report to enter the guaranty filed by the manufacture in the office of the Secretary of Agriculture, in such connection with the analytical results that the two may be compared. An unfortunate practice has grown up among manufacturers of so wording the guaranty that it seems to declare the presence in the goods of an amount of a valuable constituent ranging from a certain minimum to a much higher maximum; thus, "Potash, 2 to 4 per cent." is a guaranty not infrequently given. In reality, the sole guaranty is for 2 per cent. The guaranteed amounts given for each brand in the following tables, are copied from the guaranties filed by the maker of the goods with the Secretary of Agriculture, the lowest figure given for any constituent being considered to be the amount guaranteed. For compactness and because no essentially important fact is suppressed thereby, the guaranties for soluble and reverted phosphoric acid have not been given separately, but are combined into a single guaranty for available phosphoric acid; in cases where the maker's guaranty does not specifically mention available phosphoric acid, the sum of the lowest figures given by him for soluble and reverted phosphoric acid is used. The law of 1879 allowed the maker to express his guaranty for nitrogen either in terms of that element or in terms of the ammonia equivalent thereto; since ammonia is composed of three parts of hydrogen and fourteen parts of nitrogen, it is a very simple matter to calculate the amount of one, when the amount of the other is given; the amount of nitrogen multiplied by 1.214 will give the corresponding amount of ammonia, and the amount of ammonia multiplied by 0.824 will give the corresponding amount of nitrogen. In these tables, the expression is in terms of nitrogen.

The law of 1901 abolishes this alternative and requires that the guaranty shall be given in terms of nitrogen. Many manufacturers after complying with the terms of the law, insert additional items in their guaranties, often with the result of misleading or confusing the buyer; the latter will do well to give heed to those items only that are given as the law requires and that are presented in these tables.

A summary of the analyses made this season may be presented as follows:

Summary of Analyses Made This Season.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Number of analyses,	412	99	4	45	34
Moisture, per cent.,	9.66	10.68	5.58	10.09	5.84
Phosphoric acid:					
Total per cent.,	9.85	11.31	14.91	15.15	20.80
Soluble, per cent.,	4.46	5.86	4.16	9.32	.....
Reverted, per cent.,	3.50	4.25	4.07	4.10	.....
Insoluble, per cent.,	1.89	1.20	6.68	1.73	.....
Potash, per cent.,	4.24	3.43	.....	.....	.....
Nitrogen, per cent.,	1.60	.....	1.77	.....	3.34
Mechanical analysis of bone:					
Fine, .....	.....	.....	.....	.....	75
Coarse, .....	.....	.....	.....	.....	25
Commercial valuation,	24.79	15.16	22.65	12.99	28.29
Average selling price,	23.55	16.17	24.40	12.75	29.02
Commercial value of samples whose selling price is ascertained,	24.76	15.19	22.65	12.88	28.23

The cases of departure of goods from their guaranteed composition observed this season, including only those cases in which it amounted to two-tenths per cent. or more, were as follows:

Summary of Instances of Deficiency From Guaranty.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Deficient in four constituents,	3	.....	.....	.....	.....
Deficient in three constituents,	15	2	.....	.....	.....
Deficient in two constituents,	51	6	2	4	1
Deficient in one constituent,	118	34	.....	9	15
Total samples in which deficiency occurred,...	187	42	2	13	16

The cases of deficiency noted during the past thirteen seasons in the goods as compared with their guaranties expressed in percentage of the total number of goods of each class analyzed, are as follows:

Percentage of Deficiency, 1899-1906.

	Springs, 1899.	Fall, 1899.	Springs, 1900.	Fall, 1900.	Springs, 1901.	Fall, 1901.	Springs, 1902.	Fall, 1902.	Springs, 1903.	Fall, 1903.	Springs, 1904.	Fall, 1904.	Springs, 1905.	Fall, 1905.	Springs, 1906.
Complete fertilizers,	38.4	33.7	42.0	40.8	31.9	31.6	40.0	36.7	37.5	37.9	39.5	49.2	35.3	37.5	45.4
Dissolved bone,	50.0	14.3	50.0	50.0	+	40.0	30.3	50.0	33.3	63.6	+	50.0	\$100.0	66.6	50.0
Rock and potash,	19.1	34.2	29.2	33.3	31.7	26.2	30.3	43.5	32.9	43.2	50.7	35.3	30.9	33.0	42.4
Dissolved rock,	13.8	14.5	5.4	19.4	22.5	8.2	15.2	8.9	23.2	20.0	20.0	11.1	3.3	33.0	28.8
Ground bone,	18.4	25.3	36.7	11.8	34.1	18.2	17.2	25.0	33.3	.....	36.3	36.8	40.0	31.4	49.0
All classes except miscellaneous,	30.9	29.2	35.2	34.3	30.8	27.6	34.2	33.2	35.1	44.7	39.6	41.4	32.8	31.4	43.8

*Only two samples analyzed.

†Only one sample analyzed.

‡Only one sample analyzed for which guaranties are reported.

§Only two samples analyzed for which guaranties are recorded.

FERTILIZER ANALYSES AUGUST 1, TO DECEMBER 31, 1906.

Since August 1, 1906 there have been received from authorized sampling agents eleven hundred and ten fertilizer samples, of which four hundred and twenty-two were subject to analysis, the remainder being rejected either because they represented brands analyzed last season, or because they were regarded as not certainly representative of the brand whose name they bore. When two or more samples representing the same brand were received equal portions from the several samples were united and the composite sample was subject to analysis.

The samples analyzed group themselves as follows, 266 complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 7 dissolved bones furnishing phosphoric acid and nitrogen; 71 rock-and-potash fertilizers, furnishing phosphoric acid and potash; 43 acidulated rock phosphates, furnishing phosphoric acid only; 34 ground bones, furnishing phosphoric acid and nitrogen, and one miscellaneous sample, which group includes substances not properly classified under the foregoing heads.

The determinations to which a complete fertilizer is subjected are as follows: (1) Moisture, useful for the comparison of analyses, for indication of dry condition and fitness for drilling, and also of the conditions under which the fertilizer was kept in the warehouse. (2) Phosphoric acid—total, that portion soluble in water, and of the residue, that portion not soluble in warm ammonia citrate solution (a solution supposed to represent the action of plant roots upon the fertilizer), which is assumed to have little immediate food value. By difference, it is easy to compute the so-called “reverted” acid, which is the portion insoluble in water but soluble in the citrate. The sum of the soluble and reverted is commonly called the “available” phosphoric acid. (3) Potash soluble in water—most of that present in green sand marl and crushed minerals, and even some of that present in vegetable materials such as cotton-seed meal, not being included because insoluble in water even after long boiling. (4) Nitrogen—This element is determined by a method which simply accounts for all present, without distinguishing between the quantities present in the several forms of ammonium salts, nitrates or organic matter. (5) Chlorin; this determination is made to afford a basis for estimating the proportion of the potash that is present as chlorid or muriate, the cheaper source. The computation is made on the assumption that the chlorin present, unless in excess, has been introduced in the form of muriate of potash; but doubtless there are occasional exceptions to this rule. One part of chlorin combines with 1.326 parts of potash to form the pure muriate; knowing the chlorin, it is, therefore, easy to compute the potash equivalent thereto. (7) In the case of ground bone, the state of subdivision is determined by sifting through accurately made sieves; the cost of preparation and especially the promptness of action of bone

in the soil depends very largely on the fineness of its particles the finer being much more quickly useful to the plant.

The law having required the manufacturer to guarantee the amount of certain valuable ingredients present in any brand he may put upon the market, chemical analysis is employed to verify the guaranties stamped upon the fertilizer sacks. It has, therefore, been deemed desirable in this report to enter the guaranty filed by the manufacturer in the office of the Secretary of Agriculture, in such connection with the analytical results that the two may be compared. An unfortunate practice has grown up among manufacturers of so wording the guaranty that it seems to declare the presence in the goods of an amount of a valuable constituent ranging from a certain minimum to a much higher maximum; thus, "Potash, 2 to 4 per cent." is a guaranty not infrequently given. In reality, the sole guaranty is for 2 per cent. The guaranteed amounts given for each brand in the following tables, are copied from the guaranties filed by the maker of the goods with the Secretary of Agriculture, the lowest figure given for any constituent being considered to be the amount guaranteed. For compactness and because no essentially important fact is suppressed thereby, the guaranties for soluble and reverted phosphoric acid have not been given separately, but are combined in a single guaranty for available phosphoric acid; in cases where the maker's guaranty does not specifically mention available phosphoric acid, the sum of the lowest figures given by him for soluble and reverted phosphoric acid is used. The law of 1879 allowed the maker to express his guaranty for nitrogen either in terms of that element or in terms of the ammonia equivalent thereto; since ammonia is composed of three parts of hydrogen and fourteen parts of nitrogen, it is a very simple matter to calculate the amount of one, when the amount of the other is given; the amount of nitrogen multiplied by 1.214 will give the corresponding amount of ammonia, and the amount of ammonia multiplied by 0.824 will give the corresponding amount of nitrogen. In these tables, the expression is in terms of nitrogen.

The law of 1901 abolishes this alternative and requires that the guaranty shall be given in terms of nitrogen. Many manufacturers after complying with the terms of the law, insert additional items in their guaranties, often with the result of misleading or confusing the buyer; the latter will do well to give heed to those items only that are given as the law requires and that are presented in these tables.

A summary of the analyses made this season may be presented as follows:

Summary of Analyses Made This Season.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Number of analyses,	266	71	7	43	34
Moisture, per cent.,	10.10	10.66	7.92	9.86	4.73
Phosphoric acid:					
Total, per cent.,	10.48	11.61	15.26	15.23	22.00
Soluble, per cent.,	4.24	5.29	5.11	8.62	.....
Reverted, per cent.,	4.09	4.88	5.10	4.93	.....
Insoluble, per cent.,	2.15	1.44	5.05	1.68	.....
Potash, per cent.,	3.37	3.35	.....	.....	.....
Nitrogen, per cent.,	1.32	.....	2.02	.....	3.26
Mechanical analyses of bone:					
Fine, .....	.....	.....	.....	.....	70
Coarse, .....	.....	.....	.....	.....	30
Commercial valuation,	22.90	15.08	25.33	12.97	28.73
Average selling price,	21.87	15.76	22.06	13.45	27.80
Commercial value of samples whose selling price is ascertained,	22.99	15.06	25.33	12.99	29.12

The cases of departure of goods from their guaranteed composition observed this season, including only those cases in which it amounted to two-tenths per cent. or more, were as follows:

Summary of Instances of Deficiency From Guaranty.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Deficient in four constituents, .....	.....	.....	.....	.....	.....
Deficient in three constituents,	11	2	.....	.....	.....
Deficient in two constituents,	35	4	.....	3	1
Deficient in one constituent,	59	22	2	8	4
Total number of samples in which deficiencies occur,	105	28	2	11	5

The cases of deficiency noted during the past ten seasons in goods as compared with their guaranties expressed in percentage of the total number of goods of each class analyzed, are as follows:

Percentage of Deficiency 1902-1906.

	Spring, 1902.	Fall, 1902.	Spring, 1903.	Fall, 1903.	Spring, 1904.	Fall, 1904.	Spring, 1905.	Fall, 1905.	Spring, 1906.	Fall, 1906.
Complete fertilizers...	40.0	36.7	37.5	37.9	39.5	49.2	35.3	37.5	45.4	39.5
Dissolved bone,	*100.0	50.0	33.3	63.6	†	50.0	†100.0	66.6	50.0	23.5
Rock and potash,	30.3	43.5	32.9	43.2	50.7	35.3	30.9	33.0	42.4	40.0
Dissolved rock,	15.2	8.9	23.2	20.0	20.0	11.1	9.3	10.0	28.8	25.6
Ground bone,	17.2	25.0	33.3	.....	36.3	36.8	40.0	31.4	49.0	14.7
All classes except miscellaneous,	34.2	33.2	35.1	44.7	39.6	41.4	32.8	31.4	43.8	35.8

*Only two samples analyzed.

†Only two samples analyzed for which no guarantees are reported.

‡Only two samples analyzed for which guarantees are recorded.

A comparison of the average composition of all samples of complete fertilizers for which guaranties are recorded with the average of the corresponding guaranties, for several seasons past including those of this season follows:

Average Composition and Guaranty Compared.

	Average composition. Per cent.	Average guaranty. Per cent.
Spring, 1902.		
Phosphoric acid:		
Total,	10.80	9.20
Available,	8.25	7.82
Potash,	3.90	3.66
Nitrogen,	1.62	1.58
Fall, 1902.		
Phosphoric acid:		
Total,	12.58	11.40
Available,	9.25	9.29
Potash,	2.69	2.60
Nitrogen,	1.57	1.55
Spring, 1903.		
Phosphoric acid:		
Total,	11.90	10.67
Available,	9.36	8.73
Potash,	3.85	3.63
Nitrogen,	1.58	1.61
Fall, 1903.		
Phosphoric acid:		
Total,	10.76	9.65
Available,	8.84	8.13
Potash,	4.09	3.90
Nitrogen,	1.33	1.29
Spring, 1904.		
Phosphoric acid:		
Total,	10.34	9.32
Available,	8.27	7.87
Potash,	4.09	3.90
Nitrogen,	1.53	1.55
Fall, 1904.		
Phosphoric acid:		
Total,	10.49	9.72
Available,	8.59	7.70
Potash,	2.87	2.81
Nitrogen,	1.25	1.29
Spring, 1905.		
Phosphoric acid:		
Total,	10.16	9.42
Available,	8.50	7.92
Potash,	4.55	4.22
Nitrogen,	1.61	1.58
Fall, 1905.		
Phosphoric acid:		
Total,	10.63	9.62
Available,	8.72	8.13
Potash,	2.90	2.42
Nitrogen,	1.26	1.20
Spring, 1906.		
Phosphoric acid:		
Total,	9.73	9.21
Available,	7.88	7.77
Potash,	4.21	3.95
Nitrogen,	1.57	1.53
Fall, 1906.		
Phosphoric acid:		
Total,	10.45	9.70
Available,	8.23	8.16
Potash,	3.12	2.95
Nitrogen,	1.32	1.31

It is of interest to note how closely the system of valuations, based upon the wholesale prices of raw materials in the principal markets during the most important buying season and upon certain average allowances for expenses and profits on the part of the mixer and jobber, coincides with the retail prices later ascertained. A comparison for several seasons past is given below:

Comparison of Selling Price and Valuation, 1902-1906.

	Selling price.	Valuation.	Excess of valuation over selling price.
Complete fertilizers:			
1902, Spring,	24.10	25.33	1.25
Fall,	21.83	23.31	1.48
1903, Spring,	24.57	24.15	-.42
Fall,	21.98	22.77	.79
1904, Spring,	21.28	21.99	.71
Fall,	21.82	22.53	.71
1905, Spring,	24.63	25.60	.97
Fall,	21.39	22.35	.96
1906, Spring,	23.55	24.76	1.21
Fall,	21.87	22.99	1.12
Dissolved bone:			
1902, Spring,	16.50	17.35	.85
Fall,	25.20	27.08	1.78
1903, Spring,	31.17	30.87	-.30
Fall,	23.67	24.57	.90
1904, Spring,	31.50	28.42	-3.08
Fall,	21.94	27.77	5.83
1905, Spring,	23.83	22.70	-1.13
Fall,	24.78	25.85	1.11
1906, Spring,	24.40	22.65	-1.75
Fall,	22.06	25.33	3.27
Rock and potash:			
1902, Spring,	16.45	15.05	-1.40
Fall,	15.37	14.46	-.91
1903, Spring,	17.29	14.74	-2.46
Fall,	15.96	14.86	-1.10
1904, Spring,	16.47	15.46	-1.01
Fall,	15.89	14.92	-.97
1905, Spring,	16.11	15.49	-.62
Fall,	15.97	15.04	-.97
1906, Spring,	16.17	15.19	-.98
Fall,	15.76	15.06	-.70
Dissolved rock:			
1902, Spring,	13.73	13.49	-.24
Fall,	13.54	13.70	.12
1903, Spring,	15.13	13.34	-1.79
Fall,	14.64	13.12	-1.52
1904, Spring,	14.59	14.05	-.54
Fall,	13.89	14.09	.20
1905, Spring,	13.64	13.86	.22
Fall,	12.21	13.51	1.30
1906, Spring,	13.75	12.98	-.77
Fall,	13.45	12.99	-.46
Ground bone:			
1902, Spring,	28.52	26.80	-1.72
Fall,	28.00	27.51	-.48
1903, Spring,	28.67	27.25	-1.42
Fall,	27.52	27.07	-.45
1904, Spring,	28.20	27.70	-.50
Fall,	27.12	27.97	.85
1905, Spring,	29.08	26.72	-2.36
Fall,	27.70	28.70	1.00
1906, Spring,	29.02	28.23	-.79
Fall,	27.80	29.12	1.32

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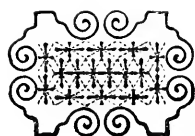
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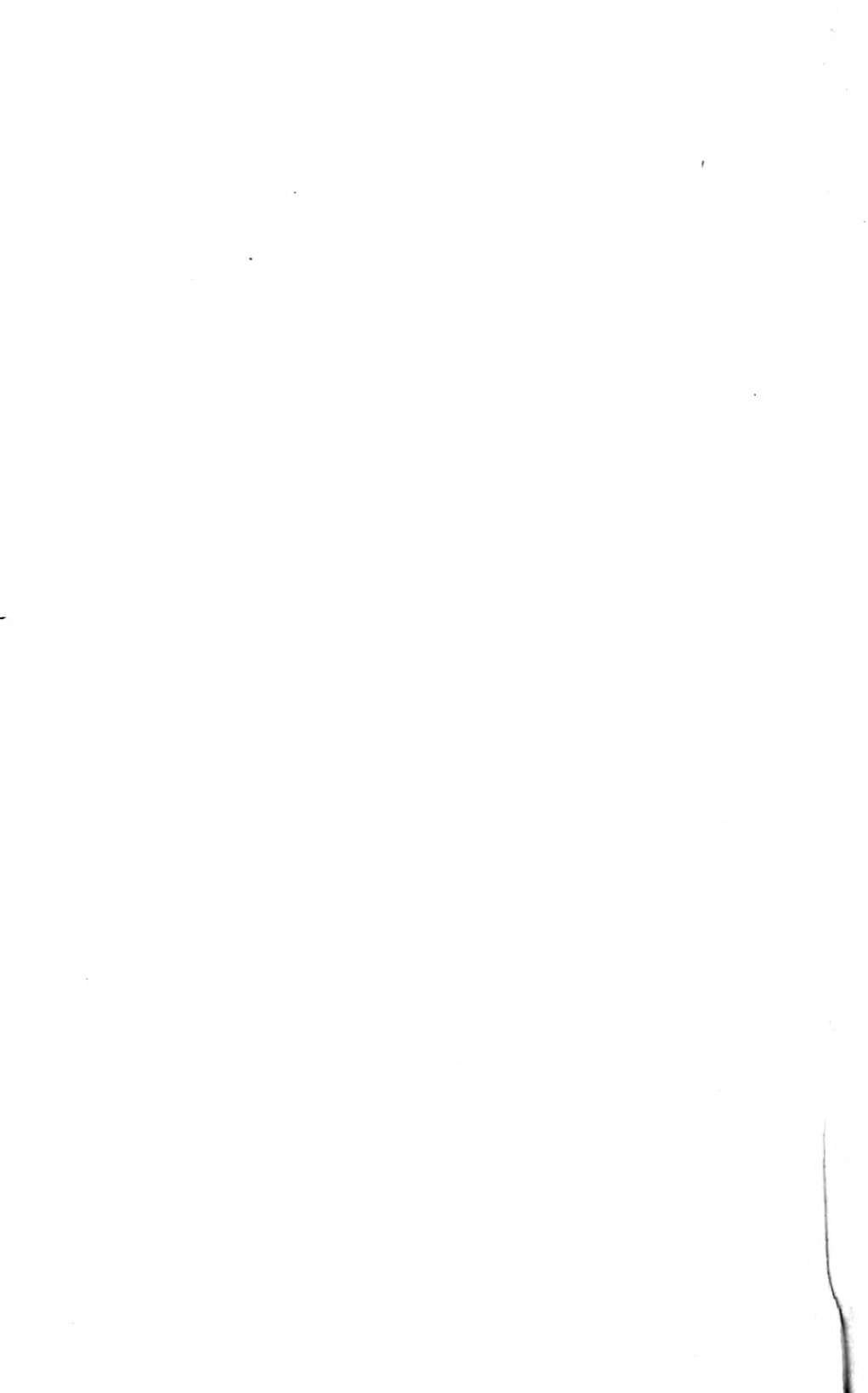
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